Agilent 1200 Series Variable Wavelength Detector G1314D /G1314E (SL Plus)

Service Manual

Agilent Technologies

Notices

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This chapter gives an introduction to the detector, instrument overview and internal connectors.

Introduction to the Detector

The Agilent 1200 Series variable wavelength detector is designed for highest optical performance, GLP compliance and easy maintenance with:

- deuterium lamp for highest intensity and lowest detection limit over a wavelength range of 190 to 600 nm,
- optional flow-cell cartridges (standard 10 mm 14 µl, high pressure 10 mm 14 µl, micro 3 mm 2 µl, semi-micro 6 mm 5 µl) are available and can be used depending on the application needs (other types may be introduced later),
- easy front access to lamp and flow cell for fast replacement,
- electronic identification of flow cell and lamp with RFID (Radio Frequency Identification) tag for unambiguous identification,
  - lamp information: part number, serial number, production date, ignitions, burn time
  - cell information: part number, serial number, production date, nominal path length, volume, maximum pressure
- built-in electronic temperature control (ETC) for improved baseline stability, and
- built-in holmium oxide filter for fast wavelength accuracy verification.
- higher data rate up to 160 Hz for ultra-fast-HPLC (G1314E VWD SL Plus), see “Peakwidth Settings” on page 91,
- data recovery card DRC gives unique "data-never-lost" insurance (G1314E VWD SL Plus), see “Run Recovery (G1314E only)” on page 86

For specifications refer to Table 4 on page 28.

Two version of the Agilent 1200 Series variable wavelength detector are available:

G1314D VWD	standard version
G1314E VWD SL Plus	adds high data rates for RRLC (Rapid Resolution LC) and unique "data-never-lost" insurance

NOTE The G1314D VWD and G1314E VWD SL Plus cannot be operated with a G1323B Control Module. Use the Instant Pilot (G4208A) as local controller.

Optical System Overview

The optical system of the detector is shown in the figure below. Its radiation source is a deuterium-arc discharge lamp for the ultraviolet (UV) wavelength range from 190 to 600 nm. The light beam from the deuterium lamp passes through a lens, a filter assembly, an entrance slit, a spherical mirror (M1), a grating, a second spherical mirror (M2), a beam splitter, and finally through a flow cell to the sample diode. The beam through the flow cell is absorbed depending on the solutions in the cell, in which UV absorption takes place, and the intensity is converted to an electrical signal by means of the sample photodiode. Part of the light is directed to the reference photodiode by the beam splitter to obtain a reference signal for compensation of intensity fluctuation of the light source. A slit in front of the reference photodiode cuts out light of the sample bandwidth. Wavelength selection is made by rotating the grating, which is driven directly by a stepper motor. This configuration allows fast change of the wavelength. The cutoff filter is moved into the lightpath above 370 nm to reduce higher order light.

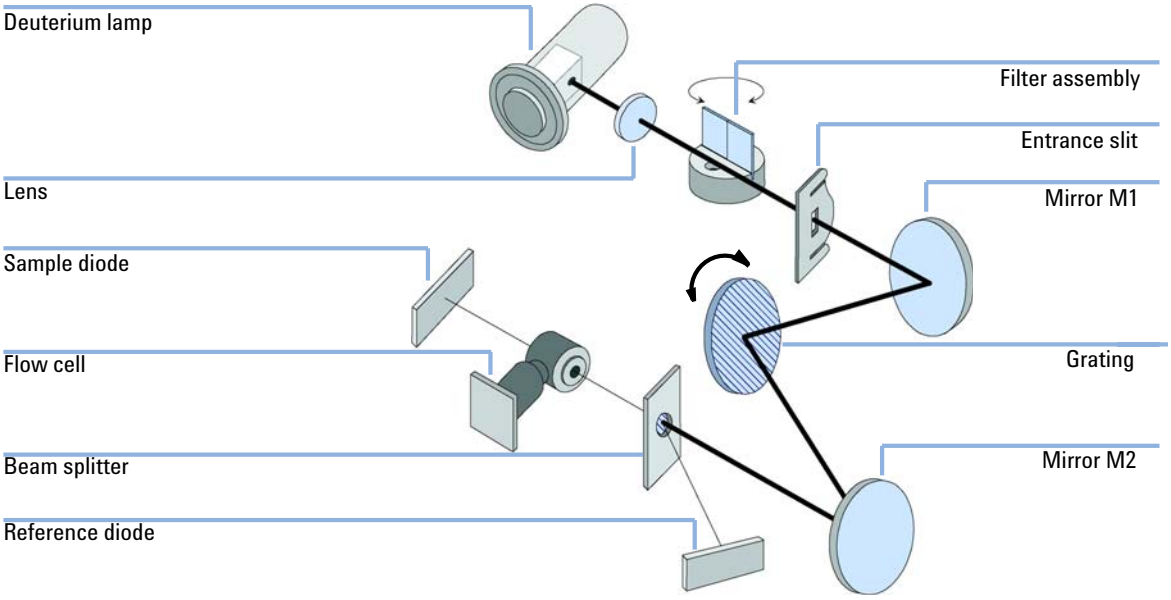

Figure 1 Optical Path of the Variable Wavelength Detector

Flow Cell

A variety of flow-cell cartridges can be inserted using the same quick and simple mounting system.

For the G1314D VWD and G1314E VWD SL Plus, the flow cells have an integrated RFID tag that contains the flow cell specific information (e.g. part number, cell volume, path length, ...). A RFID tag reader reads out this information and transfers it to the user interface.

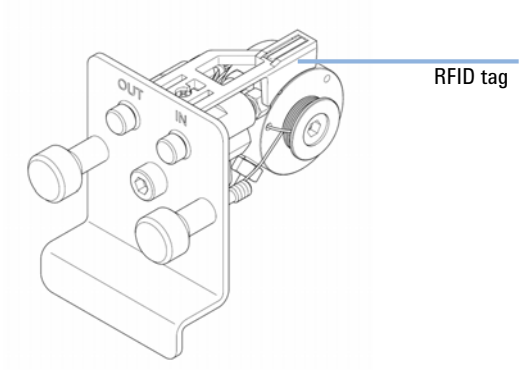

Figure 2 Flow Cell with RFID tag

Table 1 Flow Cell Data

	STD	Semi-micro	Micro	High Pressure	
Maximum pressure	40 (4)	40 (4)	120 (12)	400 (40)	bar
Path length	10 (conical)	6 (conical)	3 (conical)	10 (conical)	mm
Volume	14	5	2	14	µl
Inlet i.d.	0.17	0.17	0.12	0.17	mm
Inlet length	750	750	310	310	mm
Outlet i.d.	0.25	0.25	0.17	0.25	mm
Outlet length	120	120	120	120	mm
Materials in contact with solvent	SST, quartz, PTFE, PEEK	SST, quartz, PTFE	SST, quartz, PTFE	SST, quartz, Kapton	

Lamp

The light source for the UV wavelength range is a deuterium lamp. As a result of plasma discharge in a low pressure deuterium gas, the lamp emits light over the 190 to 600 nm wavelength range.

For the G1314D VWD and G1314E VWD SL Plus, the lamp has an integrated RFID tag that contains the lamp specific information (e.g. part number, burn time, ...). A RFID tag reader reads out this information and transfers it to the user interface.

Source Lens Assembly

The source lens receives the light from the deuterium lamp and focuses it onto the entrance slit.

Entrance Slit Assembly

The entrance slit assembly has an exchangeable slit. The standard one has a 1-mm slit. For replacement and calibration purposes to optimize the alignment, a slit with a hole is needed.

Filter Assembly

The filter assembly is electromechanically actuated. During wavelength calibrations it moves into the light path.

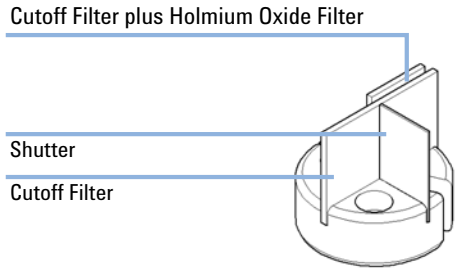

Figure 3 Filter Assemby

The filter assembly has two filters installed and is processor-controlled.

OPEN	nothing in light path at $\lambda < 370$ nm
CUTOFF	cut off filter in light path at $\lambda > 370$ nm
HOLMIUM	holmium oxide filter for wavelength check
SHUTTER	for measurement of dark current of photo diodes

A photo sensor determines the correct position.

Mirror Assemblies M1 and M2

The instrument contains two spherical mirrors (M1 and M2). The beam adjustable is vertically and horizontally. Both mirrors are identical.

Grating Assembly

The grating separates the light beam into all its component wavelengths and reflects the light onto mirror #2.

The stepper motor reference position is determined by a plate fitted onto the motor shaft, interrupting the beam of a photo sensor. The wavelength calibration of the grating is done at the zero order light position and at 656 nm, which is the emission line of the deuterium lamp.

Beam Splitter Assembly

The beam splitter splits the light beam. One part goes directly to the sample diode. The other part of the light beam goes to the reference diode.

Photo Diodes Assemblies

Two photo diode assemblies are installed in the optical unit. The sample diode assembly is located on the left side of the optical unit. The reference diode assembly is located in the front of the optical unit.

Photo Diode ADC (analog-to-digital converter)

The photo diode current is directly converted to digital data direct photo current digitalization. The data is transferred to the detector main board . The photo diode ADC boards are located close to the photo diodes.

Electrical Connections

- The CAN bus is a serial bus with high speed data transfer. The two connectors for the CAN bus are used for internal Agilent 1200 Series module data transfer and synchronization.
- One analog output provides signals for integrators or data handling systems.
- The REMOTE connector may be used in combination with other analytical instruments from Agilent Technologies if you want to use features such as start, stop, common shut down, prepare, and so on.
- With the appropriate software, the RS-232C connector may be used to control the module from a computer through a RS-232C connection. This connector is activated and can be configured with the configuration switch. See your software documentation for further information.
- The power input socket accepts a line voltage of 100 – 240 volts AC ± 10% with a line frequency of 50 or 60 Hz. Maximum power consumption is 220 VA. There is no voltage selector on your module because the power supply has wide-ranging capability. There are no externally accessible fuses, because automatic electronic fuses are implemented in the power supply. The security lever at the power input socket prevents the module cover from being taken off when line power is still connected.

NOTE Never use cables other than the ones supplied by Agilent Technologies to ensure proper functionality and compliance with safety or EMC regulations.

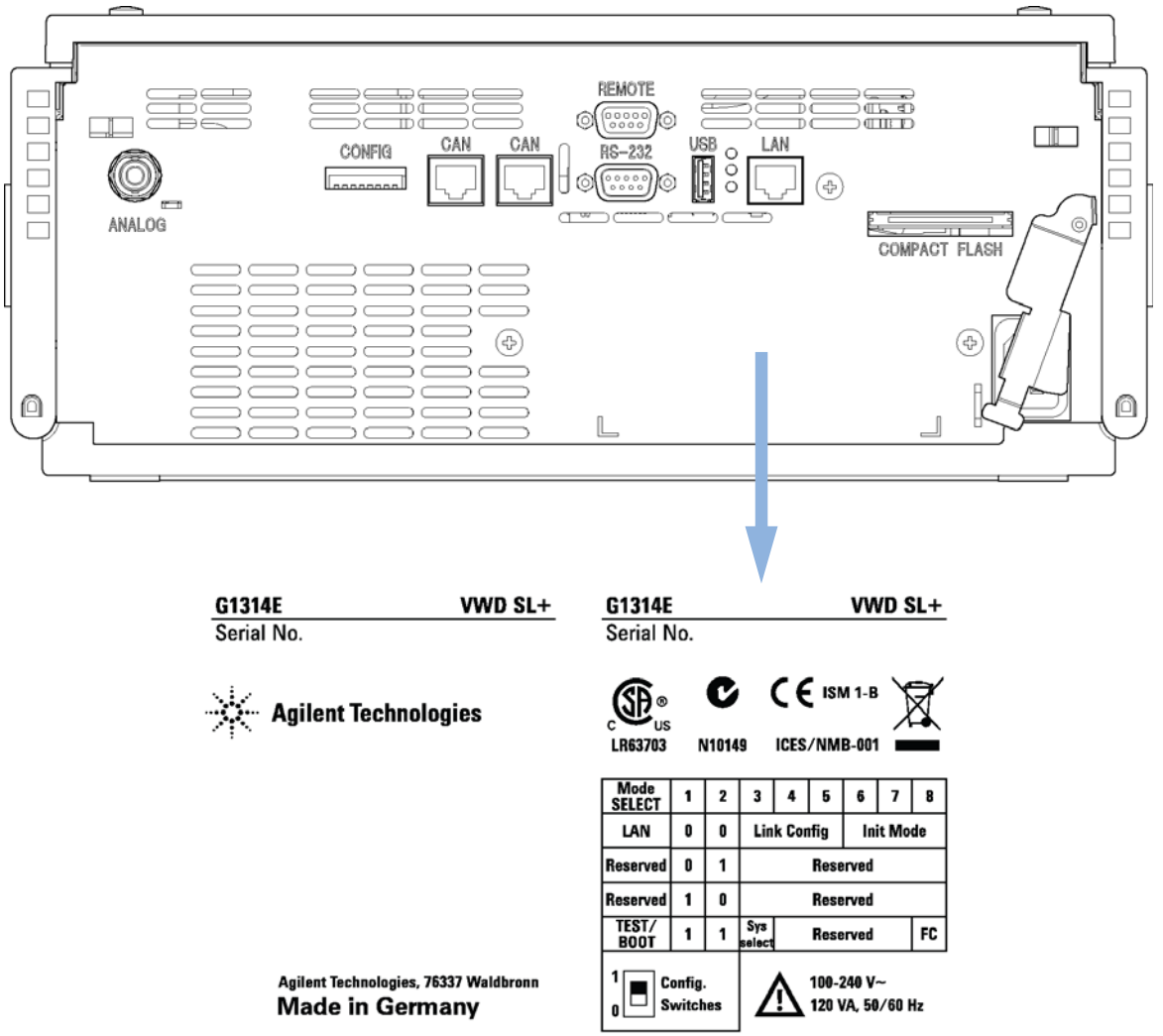

Figure 4 Rear View of G1314D/E VWD

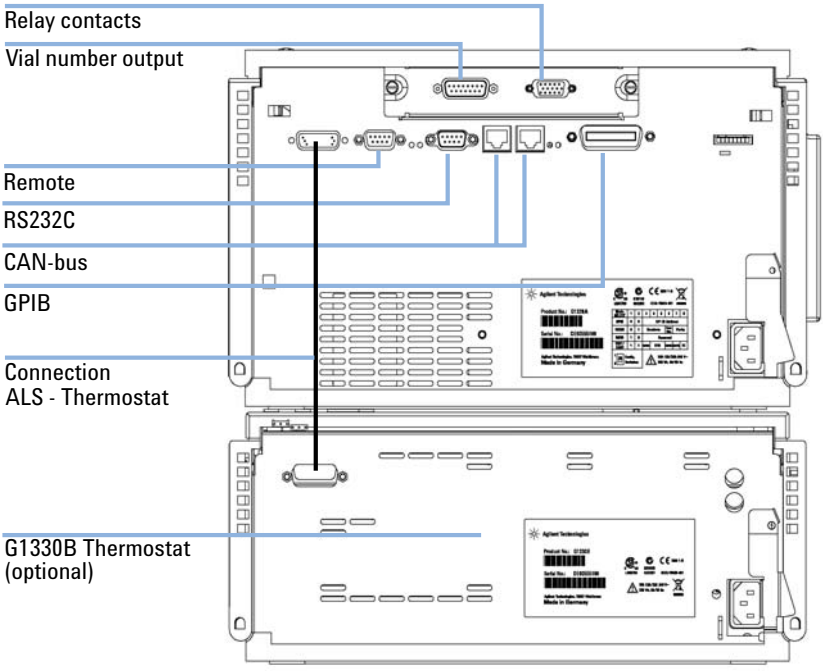

Figure 5 Autosampler (plus Thermostat) Electrical Connections

Serial Number Information

The serial number information on the instrument labels provide the following information:

CCYWWSSSSS	Format
CC	country of manufacturing • DE = Germany • JP = Japan • CN = China
YWW	year and week of last major manufacturing change, e.g. 820 could be week 20 of 1998 or 2008
SSSSS	real serial number

Instrument Layout

The industrial design of the module incorporates several innovative features. It uses Agilent's E-PAC concept for the packaging of electronics and mechanical assemblies. This concept is based upon the use of expanded polypropylene (EPP) layers foam plastic spacers in which the mechanical and electronic boards components of the module are placed. This pack is then housed in a metal inner cabinet which is enclosed by a plastic external cabinet. The advantages of this packaging technology are:

- virtual elimination of fixing screws, bolts or ties, reducing the number of components and increasing the speed of assembly/disassembly,
- the plastic layers have air channels molded into them so that cooling air can be guided exactly to the required locations,
- the plastic layers help cushion the electronic and mechanical parts from physical shock, and
- the metal inner cabinet shields the internal electronics from electromagnetic interference and also helps to reduce or eliminate radio frequency emissions from the instrument itself.

Early Maintenance Feedback (EMF)

Maintenance requires the exchange of components which are subject to wear or stress. Ideally, the frequency at which components are exchanged should be based on the intensity of usage of the instrument and the analytical conditions, and not on a predefined time interval. The early maintenance feedback (EMF) feature monitors the usage of specific components in the instrument, and provides feedback when the user-selectable limits have been exceeded. The visual feedback in the user interface provides an indication that maintenance procedures should be scheduled.

EMF Counter

The detector module provides a EMF counter for the lamp. The counter increments with lamp use, and can be assigned a maximum limit which provides visual feedback in the user interface when the limit is exceeded. Dependig on the lamp type the counter can be reset to zero after the lamp is exchanged.

Table 2

Lamp Type	Counter Reset	Comment
lamp with RFID tag	NO	
lamp without RFID tag	YES	via LMD or Instant Pilot

The detector provides the following EMF counters:

- Deuterium Lamp On-Time
- Number of UV lamp ignitions

Using the EMF Counters

The user-settable EMF limits for the EMF counters enable the early maintenance feedback to be adapted to specific user requirements. The useful lamp burn time is dependent on the requirements for the analysis (high or low sensitivity analysis, wavelength etc.), therefore, the definition of the maximum limits need to be determined based on the specific operating conditions of the instrument.

Setting the EMF Limits

The setting of the EMF limits must be optimized over one or two maintenance cycles. Initially, no EMF limit should be set. When instrument performance indicates maintenance is necessary, take note of the values displayed by lamp counters. Enter these values (or values slightly less than the displayed values) as EMF limits, and then reset the EMF counters to zero. The next time the EMF counters exceed the new EMF limits, the EMF flag will be displayed, providing a reminder that maintenance needs to be scheduled.

NOTE This function is only available via LMD or Instant Pilot.

2
Site Requirements and Specifications

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Performance Specifications 28

This chapter gives information on environmental requirements, physical and performance specifications.

Site Requirements

Site Requirements

A suitable environment is important to ensure optimal performance of the instrument.

Power Consideration

The detector power supply has wide ranging capabilities, see Table 3 on page 27. It accepts any line voltage in the above mentioned range. Consequently, there is no voltage selector in the rear of the detector. There are also no externally accessible fuses, because automatic electronic fuses are implemented in the power supply.

WARNING

Instrument is partially energized when switched off

The power supply still uses some power, even when the power switch on the front panel is turned OFF. Repair work at the detector can lead to personal injuries, e. g. shock hazard, when the detector cover is opened and the instrument is connected to power.

➔ To disconnect the detector from the power line, unplug the power cord.

WARNING

Incorrect line voltage at the instrument

Shock hazard or damage of your instrumentation can result, if the devices are connected to a line voltage higher than specified.

➔ Connect your instrument to the specified line voltage.

CAUTION

Unaccessable power plug.

In case of emergency it must be possible to disconnect the instrument from the power line at any time.

➔ Make sure the power connector of the instrument can be easily reached and unplugged.

➔ Provide sufficient space behind the power socket of the instrument to unplug the cable.

Power Cords

Different power cords are offered as options with the detector. The female end of the power cords is identical. It plugs into the power-input socket at the rear of the detector. The male end of each power cord is different and designed to match the wall socket of a particular country or region.

WARNING

The absence of ground connection and the use of an unspecified power cord can lead to electric shock or short circuit.

Electric Shock

➔ Never operate your instrumentation from a power outlet that has no ground connection.

➔ Never use a power cord other than the Agilent Technologies power cord designed for your region.

WARNING

Use of unsupplied cables

Using cables not supplied by Agilent Technologies can lead to damage of the electronic components or personal injury.

➔ Never use cables other than the ones supplied by Agilent Technologies to ensure proper functionality and compliance with safety or EMC regulations.

Bench Space

The detector dimensions and weight (see Table 3 on page 27) allows you to place the detector on almost any desk or laboratory bench. It needs an additional 2.5 cm (1.0 inches) of space on either side and approximately 8 cm (3.1 inches) in the rear for air circulation and electric connections.

If the bench should carry a Agilent 1200 Series system, make sure that the bench is designed to bear the weight of all modules.

The detector should be operated in a horizontal position.

Environment

Your detector will work within specifications at ambient temperatures and relative humidity as described in Table 3 on page 27.

ASTM drift tests require a temperature change below 2 °C/hour (3.6 °F/hour) measured over one hour period. Our published drift specification (refer also to "Performance Specifications" on page 28) is based on these conditions. Larger ambient temperature changes will result in larger drift.

Better drift performance depends on better control of the temperature fluctuations. To realize the highest performance, minimize the frequency and the amplitude of the temperature changes to below 1 °C/hour (1.8 °F/hour). Turbulences around one minute or less can be ignored.

CAUTION

Condensation within the module

Condensation will damage the system electronics.

➔ Do not store, ship or use your module under conditions where temperature fluctuations could cause condensation within the module.

➔ If your module was shipped in cold weather, leave it in its box and allow it to warm up slowly to room temperature to avoid condensation.

Physical Specifications

Table 3 Physical Specifications

Type	Specification	Comments
Weight	11 kg (25 lbs)	
Dimensions (height × width × depth)	140 × 345 × 435 mm (5.5 × 13.5 × 17 inches)	
Line voltage	100 – 240 VAC, ± 10%	Wide-ranging capability
Line frequency	50 or 60 Hz, ± 5%	
Power consumption	120 VA, 100 W / 341 BTU	Maximum
Ambient operating temperature	0–55 °C (32–131 °F)	
Ambient non-operating temperature	-40–70 °C (-4–158 °F)	
Humidity	< 95%, at 25–40 °C (77–104 °F)	Non-condensing
Operating altitude	Up to 2000 m (6500 ft)	
Non-operating altitude	Up to 4600 m (14950 ft)	For storing the instrument
Safety standards: IEC, CSA, UL, EN	Installation Category II, Pollution Degree 2. For indoor use only.	

Performance Specifications

Table 4 Performance Specifications G1314D VWD and G1314E VWD SL Plus

Type	Specification	Comments
Detection type	Double-beam photometer	
Light source	Deuterium lamp	
Wavelength range	190–600 nm	
Short term noise	± 0.15 × 10^{-5} AU at 230 nm	Under specified condtions. See "Specifications" on page 31 below the table.
Drift	1 × 10^{-4} AU/hr at 230 nm	Under specified condtions. See "Specifications" on page 31 below the table.
Linearity	> 2.5 AU (5%) upper limit	Under specified condtions. See "Specifications" on page 31 below the table.
Wavelength accuracy	± 1 nm	Self-calibration with deuterium lines, verification with holmium oxide filter
Maximum sampling rate	20 Hz 160 Hz	G1314D VWD G1314E VWD SL PLus
Data Recovery Card (DRC)	Unique "data-never-lost" insurance. Prevents data losses, for example in case of communication breakdown.	G1314E VWD SL PLus Not supported with ChemStation B.03.02 SR1
Band width	6.5 nm typical	

Table 4 Performance Specifications G1314D VWD and G1314E VWD SL Plus

Type	Specification	Comments
Flow cells	Standard: 14-µl volume, 10-mm cell path length and 40 bar (588 psi) pressure maximum High pressure: 14-µl volume, 10-mm cell path length and 400 bar (5880 psi) pressure maximum Micro: 2-µl volume, 3-mm cell path length and 120 bar (1741 psi) pressure maximum Semi-micro: 5-µl volume, 6-mm cell path length and 40 bar (588 psi) pressure maximum	All flow cells have RFID tags for unambitious identification. Can be repaired on component level
Electronic Temperature Control (ETC)	For improved baseline stability in instable environment.	
Control and data evaluation	Agilent ChemStation for LC B.03.02 SR1 or above Instant Pilot (G4208A) with firmware B.02.07 or above	Control and data evaluation Control only
Time programmable	Wavelength, Reference and Sample scan, balance, steps,lamp on/off	
Spectral tools	Stop-flow wavelength scan	
Analog outputs	Recorder/integrator: 100 mV or 1 V, output range 0.001 – 2 AU, one output	
Communications	LAN card integrated on main board, Controller-area network (CAN), RS-232C, APG Remote: ready, start, stop and shut-down signals	

Table 4 Performance Specifications G1314D VWD and G1314E VWD SL Plus

Type	Specification	Comments
Safety and maintenance	Extensive diagnostics, error detection and display (through control module and Agilent ChemStation), leak detection, safe leak handling, leak output signal for shutdown of pumping system. Low voltages in major maintenance areas.	
GLP features	Early maintenance feedback (EMF) for continuous tracking of instrument usage in terms of lamp burn time with user-settable limits and feedback messages. Electronic records of maintenance and errors. Verification of wavelength accuracy with built-in holmium oxide filter.	
Housing	All materials recyclable.	

Specifications

ASTM: “Standard Practice for Variable Wavelength Photometric Detectors Used in Liquid Chromatography”.

Reference conditions: Standard flow cell, path length 10 mm, flow 1 ml/min LC-grade methanol.

Noise:

± 0.15 × 10^{-5} AU at 230 nm, TC 2 s

± 0.25 × 10^{-5} AU at 254 nm, RT 2 s, ASTM

RT = 2.2 * TC

Linearity:

Linearity is measured with caffeine at 265 nm.

NOTE The specification are based on the the standard RFID tag lamp (G1314-60101) and may be not achieved when other lamp types or aged lamps are used.

ASTM drift tests require a temperature change below 2°C/hour (3.6°F/hour) over one hour period. Our published drift specification is based on these conditions. Larger ambient temperature changes will result in larger drift.

Better drift performance depends on better control of the temperature fluctuations. To realize the highest performance, minimize the frequency and the amplitude of the temperature changes to below 1°C/hour (1.8°F/hour). Turbulences around one minute or less can be ignored.

Performance tests should be done with a completely warmed up optical unit (> one hour). ASTM measurements require that the detector should be turned on at least 24 hours before start of testing.

3
Installing the Detector

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Installing the Detector 39
Flow Connections to the Detector 42

This chapter describes the installation of the detector.

Unpacking the Detector

CAUTION

Condensation within the detector

Condensation will damage the system electronics.

➔ Do not store, ship or use your detector under conditions where temperature fluctuations could cause condensation within the detector.

➔ If your detector was shipped in cold weather, leave it in its box and allow it to warm up slowly to room temperature to avoid condensation.

Damaged Packaging

If the delivery packaging shows signs of external damage, please call your Agilent Technologies sales and service office immediately. Inform your service representative that the detector may have been damaged during shipment.

CAUTION

"Defective on arrival" problems

If there are signs of damage, please do not attempt to install the module. Inspection by Agilent is required to evaluate if the instrument is in good condition or damaged.

➔ Notify your Agilent sales and service office about the damage.

➔ An Agilent service representative will inspect the instrument at your site and initiate appropriate actions.

Delivery Checklist

Ensure all parts and materials have been delivered with the detector. The delivery checklist is shown below. Please report missing or damaged parts to your local Agilent Technologies sales and service office.

Table 5 Variable Wavelength Detector Checklist

Description	Quantity
Variable wavelength detector	1
Power cable	1
Flow cell	As ordered
User Manual	1
Accessory kit	1
CompactFlash Card	part of G1314E VWD SL Plus

Detector Accessory Kit Contents

Table 6 Accessory Kit Contents

Description	Part Number	Quantity
Accessory kit	G1314-68705	
CAN cable 0.5 m	5181-1516	1
PEEK outlet capillary kit	5062-8535	1
Fitting male PEEK	0100-1516	1
Hex key 1.5 mm	8710-2393	1
Hex key 4 mm	8710-2392	1
Wrench open end 1/4 – 5/16 inch	8710-0510	1
Wrench open end 4 mm	8710-1534	1

Optimizing the Stack Configuration

If your detector is part of a complete Agilent 1200 Series system, you can ensure optimum performance by installing the following configuration. This configuration optimizes the system flow path, ensuring minimum delay volume.

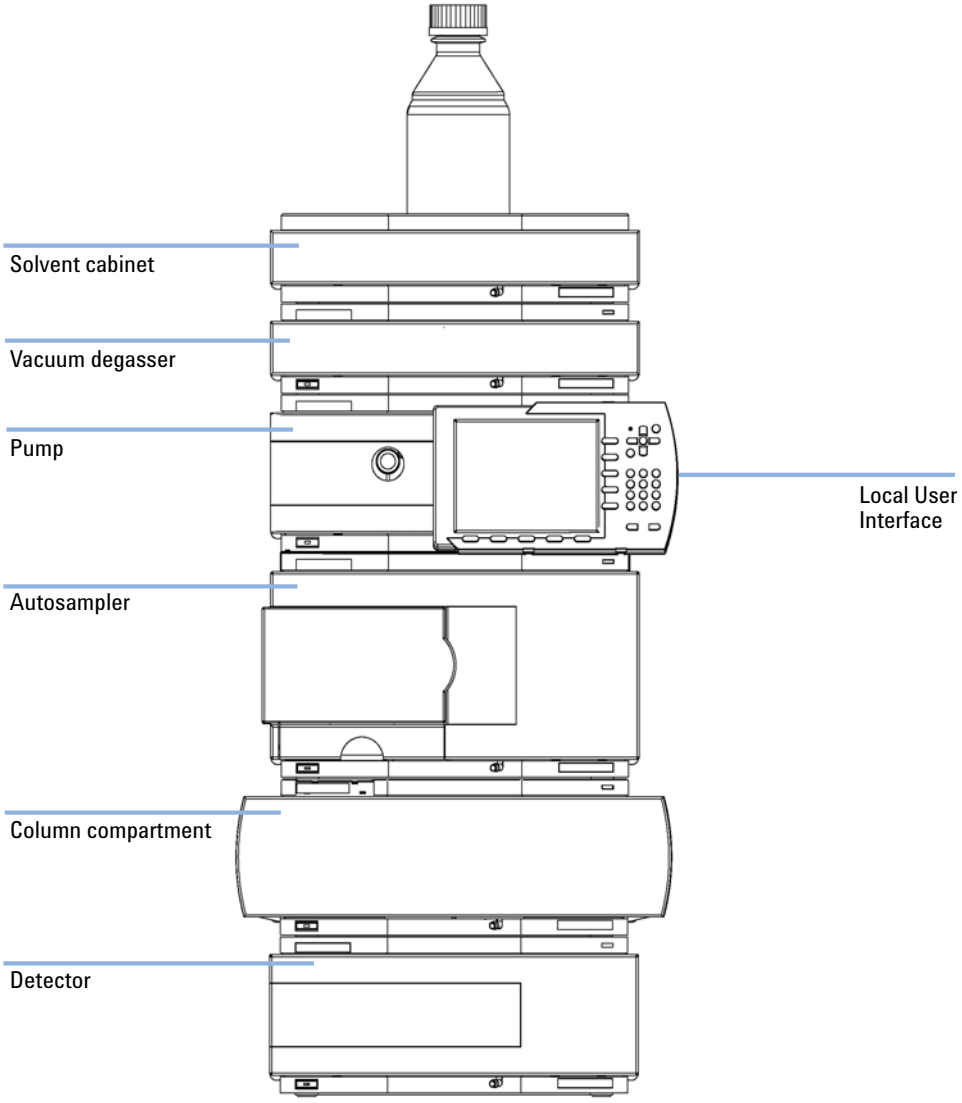


Figure 6 Recommended Stack Configuration (Front View)

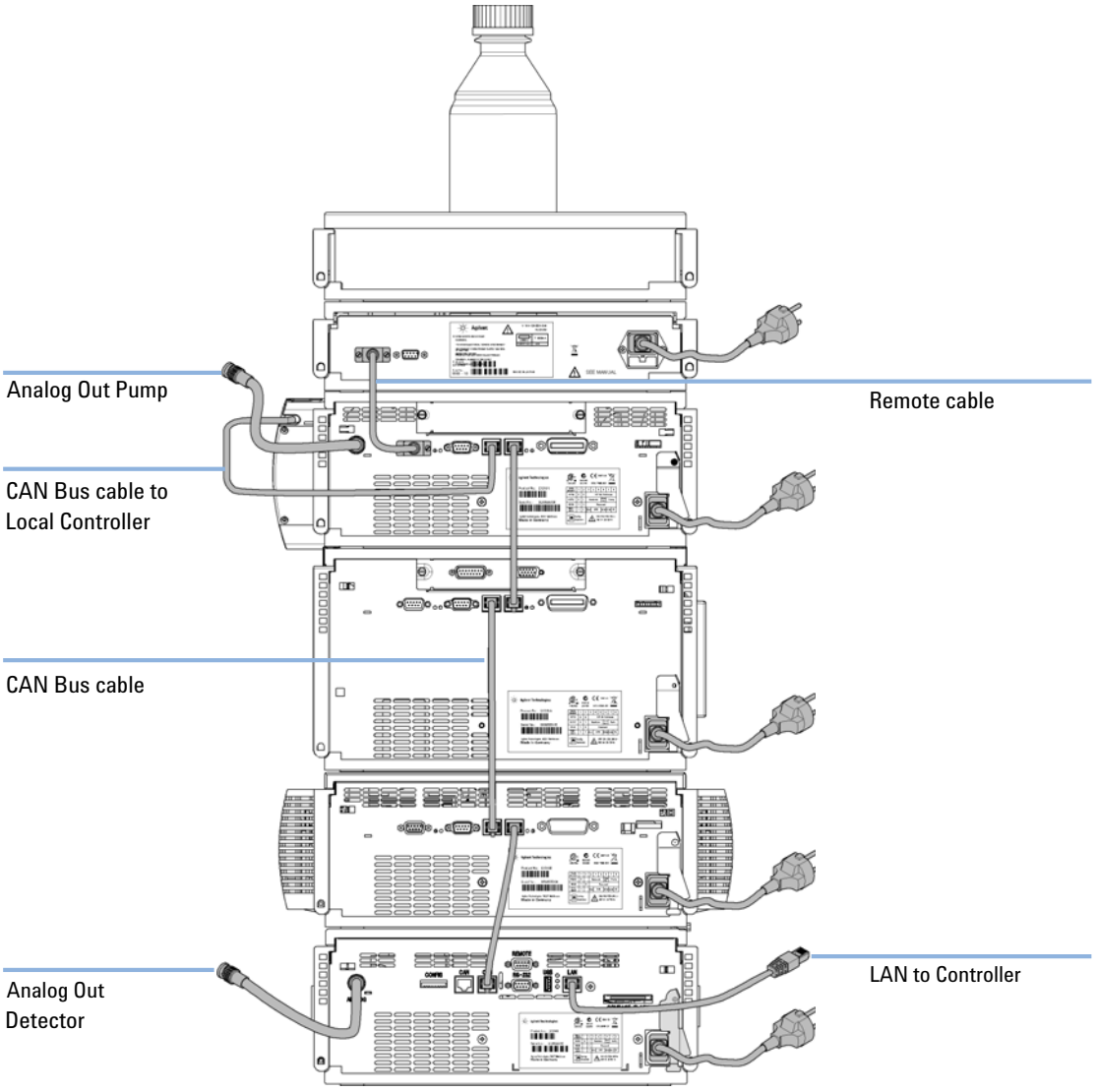


Figure 7 Recommended Stack Configuration (Rear View)

Installing the Detector

Parts required	#	Part number	Description
	1		Detector
	1		Power cord
	1		LAN cable (cross-over or twisted pair network cable)
	1		for other cables see below and section “Cable Overview” in the Service Manual.
	1		Lab Monitor & Diagnostic Software
	1		CompactFlash Card (provided with the G1314E VWD SL PLus)
	1	G4208A	Agilent ChemStation and/or Instant Pilot G4208A with appropriate software.

Preparations

Other 1100/1200 modules must have firmware A.06.1x/B06.1x or above.

Locate bench space

Provide power connections

Unpack the detector

NOTE Before adding a G1314D VWD or G1314E VWD SL Plus into an existing system assure that the existing modules have been updated to firmware revision A.06.1x/B.6.1x or above and the User Interface has the appropriate software revision that supports the G1314D VWD or G1314E VWD SL Plus.

NOTE If you want to use the "data-never-lost" feature, then assure that the CompactFlash Card is installed in the rear of the G1314E VWD SL Plus.

1 Note the MAC address of the LAN interface (rear of the module, under the configuration switch, see figure below). It's required for LAN Configuration, see "LAN Configuration" on page 45.

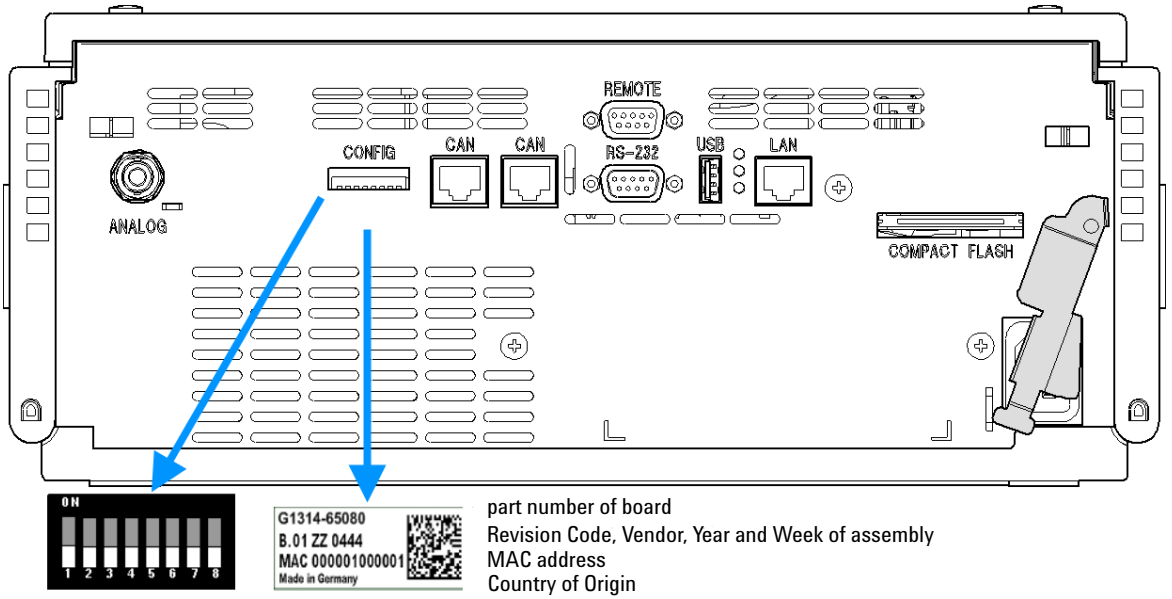


Figure 8 Rear View of Detector

2 Check the setting of the DIP switch at the rear of the detector. All switches should be in down position (BOOTP mode). If another boot mode is required refer to "Link configuration selection" on page 53.

NOTE The detector was shipped with default configuration settings (all switches down).

3 Place the detector in the stack or on the bench in a horizontal position.

4 Ensure the line power switch at the front of the detector is OFF.

5 Connect the power cable to the power connector at the rear of the detector.

6 Connect the CAN cable to other Agilent 1200 Series modules.

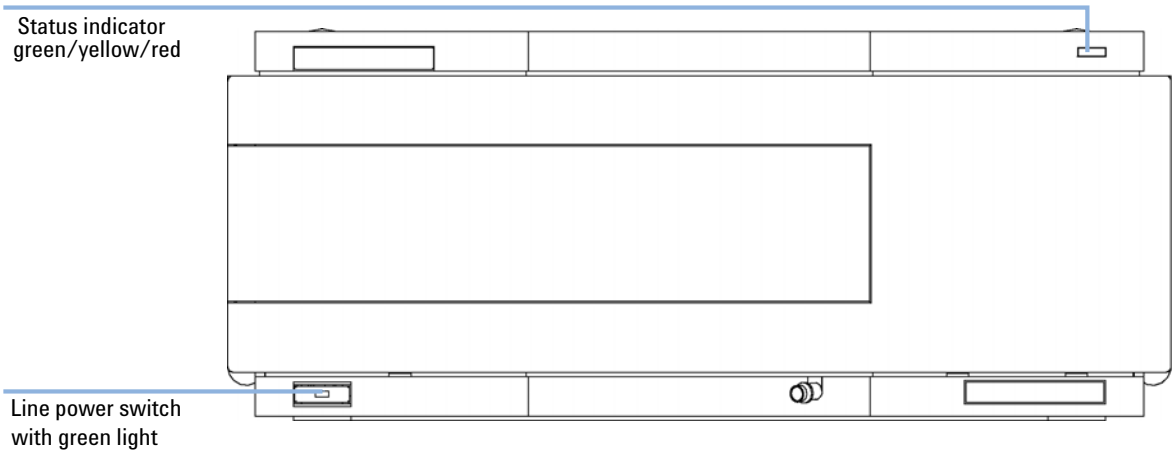
7 Connect the LAN cable (e.g. from a Agilent ChemStation as controller) to the detector's LAN connector.

NOTE In multi-detector configurations the LAN of the Agilent G1315C/D and G1365C/D must be used due to its higher data load.

8 Connect the analog cable(s) (optional).

9 Connect the APG remote cable (optional) for non-Agilent 1200 Series instruments.

10 Turn on power by pushing the button at the lower left hand side of the detector. The status LED should be green.



NOTE The detector is turned on when the line power switch is pressed and the green indicator lamp is illuminated. The detector is turned off when the line power switch is protruding and the green light is off.

NOTE To disconnect the detector from line, unplug the power cord. The power supply still uses some power, even if the power switch at the front panel is turned off.

Flow Connections to the Detector

Tools required Two wrenches 1/4–5/16 inch for capillary connections

Parts required **Description**
Other modules
Parts from accessory kit, see Table 27 on page 235

Preparations Detector is installed in the LC system.

WARNING

Toxic and hazardous solvents

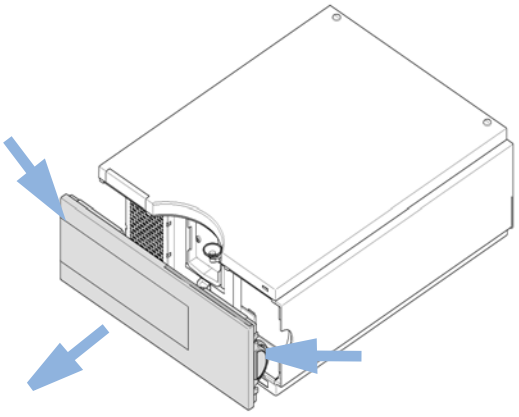
The handling of solvents and reagents can hold health risks.

➔ When working with solvents observe appropriate safety procedures (for example, goggles, safety gloves and protective clothing) as described in the material handling and safety data sheet supplied by the solvent vendor, especially when toxic or hazardous solvents are used.

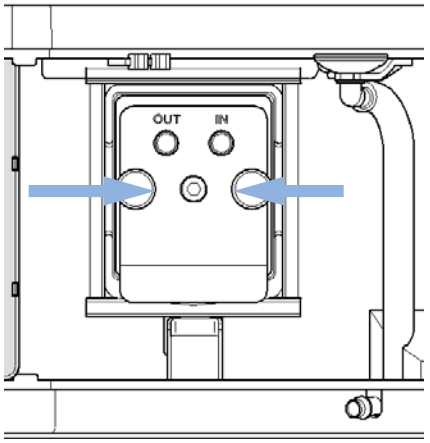
NOTE

The flow cell is shipped with a filling of isopropanol (also recommended when the instrument and/or flow cell is shipped to another location). This is to avoid breakage due to subambient conditions.

1 Press the release buttons and remove the front cover to have access to the front area.

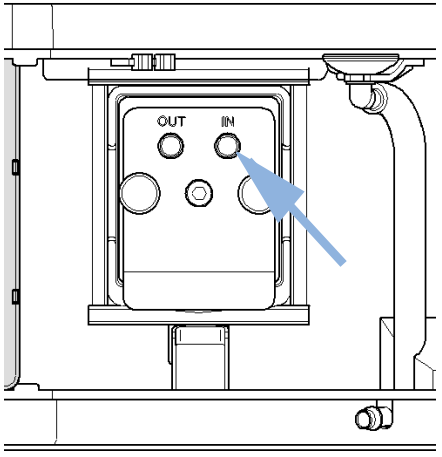


2 Remove the metal cover and install the flow cell. Press the flow cell completely into the slot and tighten the cell screws (both parallel) until the mechanical stop.



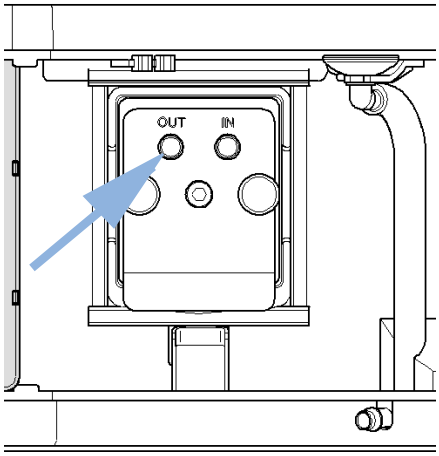
3 Assemble the column-detector capillary. Depending on the flow cell type it may be a PEEK or SST capillary.

4 Connect the newly assembled fitting of the capillary to the inlet connector.

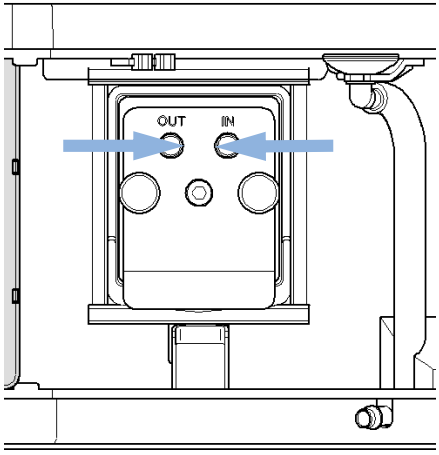


5 Connect the other end of the capillary to the column.

6 Connect the PEEK waste capillary to the outlet connector.



7 Establish a flow and observe for leakage.



8 Replace the front cover.

The installation of the detector is now complete.

NOTE The detector should be operated with the front cover in place to protect the flow cell area against strong drafts from the outside.

4
LAN Configuration

What you have to do first 46
TCP/IP parameter configuration 47
Configuration Switches 48
Initialization mode selection 49
Link configuration selection 53
Automatic configuration with Bootp 54
Storing the settings permanently with Bootp 58
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PC and Agilent ChemStation Setup 64

This chapter provides information on connecting the detector to the Agilent ChemStation PC.

What you have to do first

The module has an on-board LAN communication interface.

1 Note the MAC (Media Access Control) address for further reference. The MAC or hardware address of the LAN interfaces is a world wide unique identifier. No other network device will have the same hardware address. The MAC address can be found on a label at the rear of the module underneath the configuration switch.

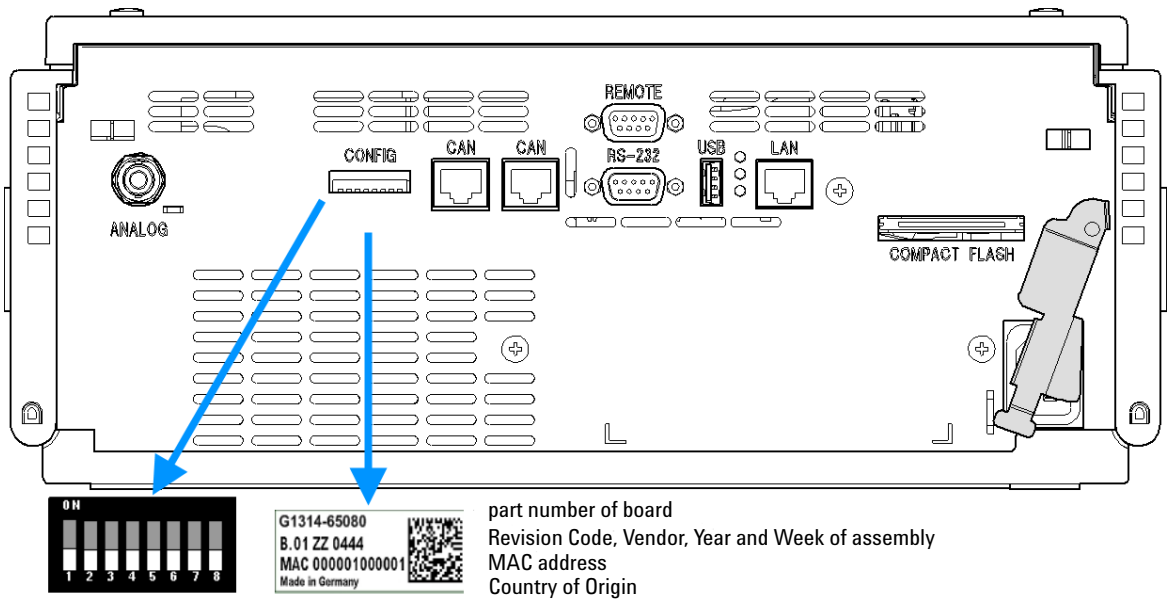


Figure 9 Location of Configuration Switch and MAC Label

2 Connect the instrument's LAN interface to

- the PC network card using a crossover network cable (point-to-point) or
- a hub or switch using a standard LAN cable.

TCP/IP parameter configuration

To operate properly in a network environment, the LAN interface must be configured with valid TCP/IP network parameters. These parameters are:

- IP address
- Subnet Mask
- Default Gateway

The TCP/IP parameters can be configured by the following methods:

- by automatically requesting the parameters from a network-based BOOTP Server (using the so-called Bootstrap Protocol)
- by manually setting the parameters using Telnet
- by manually setting the parameters using the Instant Pilot (G4208A), or
- by manually setting the parameters using the Handheld Controller (G1323B), if supported.

The LAN interface differentiates between several initialization modes. The initialization mode (short form ‘init mode’) defines how to determine the active TCP/IP parameters after power-on. The parameters may be derived from a Bootp cycle, non-volatile memory or initialized with known default values. The initialization mode is selected by the configuration switch, see Table 10 on page 53.

Configuration Switches

The configuration switch can be accessed at the rear of the module, see figure below.

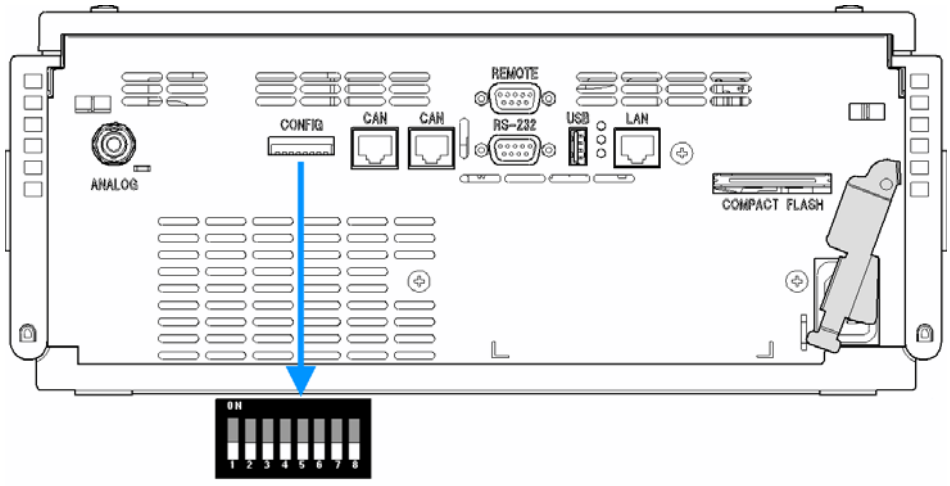


Figure 10 Location of Configuration Switch

The module is shipped with all switches set to OFF, as shown above.

NOTE To perform any LAN configuration, SW1 and SW2 must be set to OFF.

Table 7 Factory Default Settings

Initialization ('Init') Mode	Bootp, all switches down. For details see Figure 11 on page 49
Link Configuration	speed and duplex mode determined by auto-negotiation, for details see "Link configuration selection" on page 53

Initialization mode selection

The following initialization (init) modes are selectable:

Table 8 Initialization Mode Switches

	SW 6	SW 7	SW 8	Init Mode
	OFF	OFF	OFF	Bootp
	OFF	OFF	ON	Bootp & Store
	OFF	ON	OFF	Using Stored
	OFF	ON	ON	Using Default

Bootp

When the initialization mode “Bootp” is selected, the detector tries to download the parameters from a Bootp Server. The parameters obtained become the active parameters immediately. They are not stored to the non-volatile memory of the module. Therefore, the parameters are lost with the next power cycle of the module.

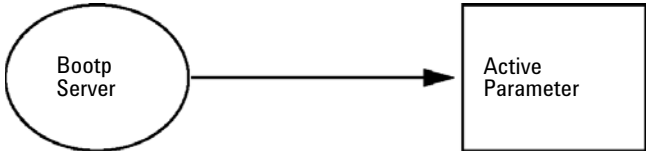


Figure 11 Bootp (Principle)

Bootp & Store

When “Bootp & Store” is selected, the parameters obtained from a Bootp Server become the active parameters immediately. In addition, they are stored to the non-volatile memory of the module. Thus, after a power cycle they are still available. This enables a kind of “bootp once” configuration of the module.

Example: The user may not want to have a Bootp Server be active in his network all the time. But on the other side, he may not have any other configuration method than Bootp. In this case he starts the Bootp Server temporarily, powers on the module using the initialization mode “Bootp & Store”, waits for the Bootp cycle to be completed, closes the Bootp Server and powers off the module. Then he selects the initialization mode “Using Stored” and powers on the module again. From now on, he is able to establish the TCP/IP connection to the module with the parameters obtained in that single Bootp cycle.

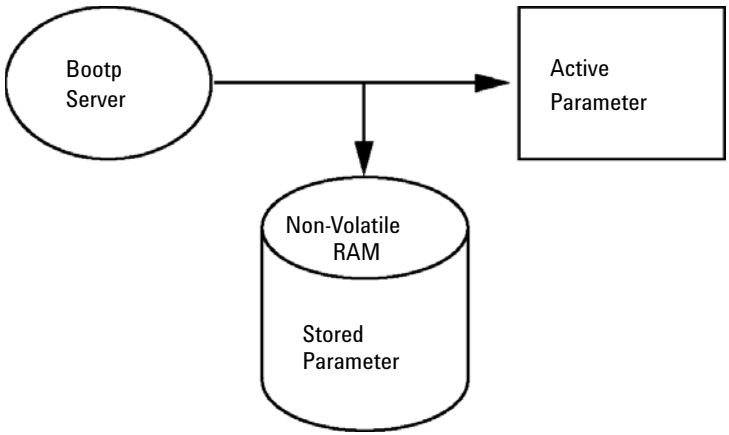


Figure 12 Bootp & Store (Principle)

NOTE Use the initialization mode “Bootp & Store” carefully, because writing to the non-volatile memory takes time. Therefore, when the module shall obtain its parameters from a Bootp Server every time it is powered on, the recommended initialization mode is “Bootp”!

Using Stored

When initialization mode “Using Stored” is selected, the parameters are taken from the non-volatile memory of the module. The TCP/IP connection will be established using these parameters. The parameters were configured previously by one of the described methods.

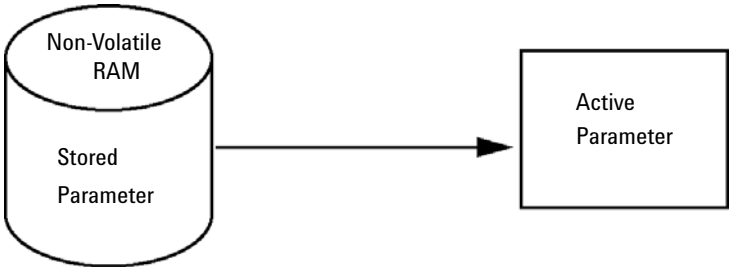


Figure 13 Using Stored (Principle)

Using Default

When “Using Default” is selected, the factory default parameters are taken instead. These parameters enable a TCP/IP connection to the LAN interface without further configuration, see Table 9 on page 51.

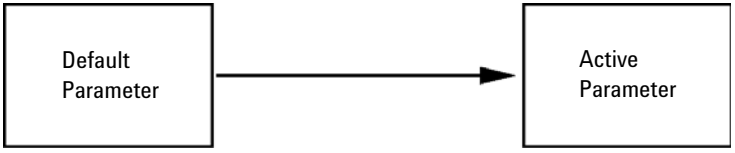


Figure 14 Using Default (Principle)

NOTE Using the default address in your local area network may result in network problems. Take care and change it to a valid address immediately.

Table 9 Using Default Parameters

IP address:	192.168.254.11
Subnet Mask:	255.255.255.0
Default Gateway	not specified

Since the default IP address is a so-called local address, it will not be routed by any network device. Thus, the PC and the module must reside in the same subnet.

The user may open a Telnet session using the default IP address and change the parameters stored in the non-volatile memory of the module. He may then close the session, select the initialization mode “Using Stored”, power-on again and establish the TCP/IP connection using the new parameters.

When the module is wired to the PC directly (e.g. using a cross-over cable or a local hub), separated from the local area network, the user may simply keep the default parameters to establish the TCP/IP connection.

NOTE In the “Using Default” mode, the parameters stored in the memory of the module are not cleared automatically. If not changed by the user, they are still available, when switching back to the mode “Using Stored”.

Link configuration selection

The LAN interface supports 10 or 100 Mbps operation in full- or half-duplex modes. In most cases, full-duplex is supported when the connecting network device - such as a network switch or hub - supports IEEE 802.3u auto-negotiation specifications.

When connecting to network devices that do not support auto-negotiation, the LAN interface will configure itself for 10- or 100-Mbps half-duplex operation.

For example, when connected to a non-negotiating 10-Mbps hub, the LAN interface will be automatically set to operate at 10-Mbps half-duplex.

If the module is not able to connect to the network through auto-negotiation, you can manually set the link operating mode using link configuration switches on the module.

Table 10 Link Configuration Switches

	SW 3	SW 4	SW 5	Link Configuration
	OFF	-	-	speed and duplex mode determined by auto-negotiation
	ON	OFF	OFF	manually set to 10 Mbps, half-duplex
	ON	OFF	ON	manually set to 10 Mbps, full-duplex
	ON	ON	OFF	manually set to 100 Mbps, half-duplex
	ON	ON	ON	manually set to 100 Mbps, full-duplex

Automatic configuration with Bootp

When automatic configuration with Bootp is selected and the LAN interface is powered on, it broadcasts a BOOTP (Bootstrap Protocol) request that contains its MAC (hardware) address. A BOOTP server daemon searches its database for a matching MAC address, and if successful, sends the corresponding configuration parameters to the detector as a BOOTP reply. These parameters become the active TCP/IP parameters immediately and the TCP/IP connection can be established.

Configuring the Agilent Bootp service program

NOTE All examples shown in this chapter will not work in your environment. You need your own IP-, Subnet-Mask- and Gateway addresses.

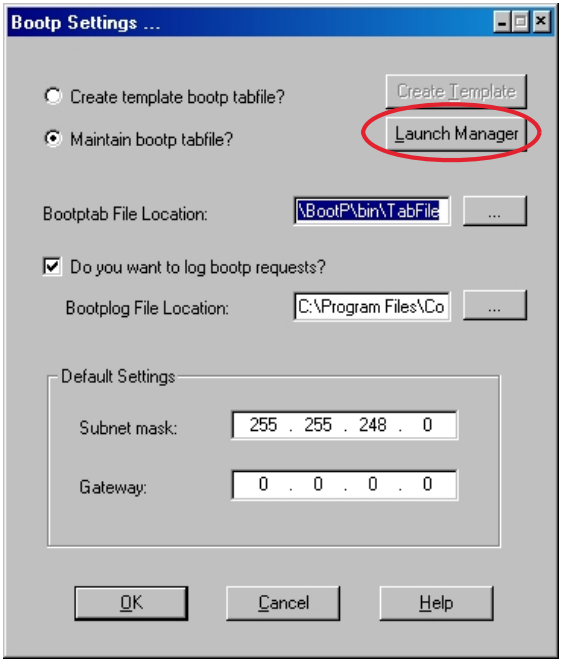
NOTE Assure that the module configuration switch is set properly. The setting should be either *Bootp* or *Bootp & Store*, see "Initialization mode selection" on page 49.

NOTE Assure that the module connected to the network is powered off.

NOTE If the Agilent Bootp Service program is not already installed on your PC, then install it from your Agilent ChemStation CD-ROM, located in folder \Bootp. The screens refer to version B.01.0x

1 The Agilent Bootp Service is placed in the start-up group and automatically is started during the boot process of the PC.

2 Open the Bootp Settings window (Figure 15 on page 55) and enter the default settings for your setup.



location of
LogFile and TabFile

Figure 15 Bootp Service Settings

3 Launch the Manager. It will open the Bootp Manager screen, see Figure 16 on page 55. This shows all network hardware that has been added (initially empty).

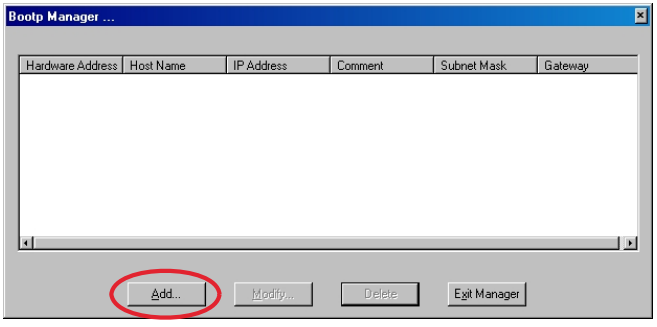


Figure 16 Bootp Manager

4 Select **Add** to enter the enter the module specific information, see Figure 17 on page 56:

- MAC address (from label on the instrument)
- host name
- IP address
- comment (instrument name / location)
- subnet mask (if different)
- gateway (if required)

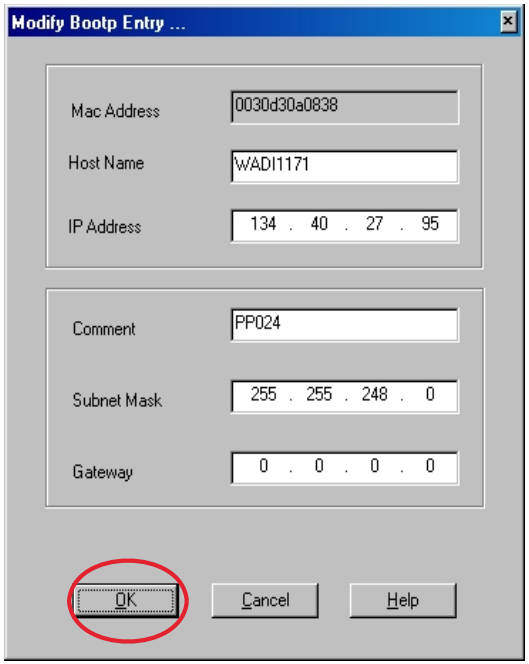


Figure 17 Bootp Manager - Enter your parameter

5 Press **OK**. The parameter are added to the Bootp Manager, see Figure 17 on page 56 and added to the TabFile, see Figure 15 on page 55:

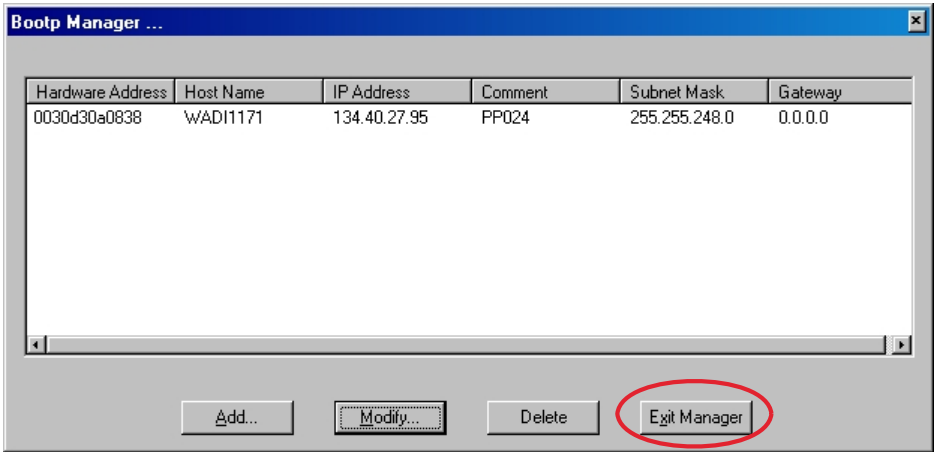


Figure 18 Bootp Manager - check your entries

6 Press **Exit Manager** and **OK** to exit the Agilent Bootp Service.

7 Now turn on the module, wait about 30-60 seconds and view the LogFile, see Figure below. It should display the request from the module with the hardware (MAC) address.

```
02/03/05 16:33:56 PM
Status: BOOTP Request received at outer most layer
Status: BOOTP Request received from hardware address: 0030D30A0838
Status: found 134.40.27.95 WADI1171:
Status: Host IP Address is: 134.40.29.56
Status: Reply to BOOTP Request has been sent
Status: BOOTP Request finished processing at outer most layer
```

Figure 19 LogFile - the detector has received the parameter

NOTE

When using this *Bootp* mode, the parameters are not written into the non-volatile memory of the module. If you delete this Bootp Configuration, the Bootp Manager will show up as shown in Figure 16 on page 55 (*Bootp* mode).

If you want to store your parameters permanently on the module (for use without the Agilent Bootp service), refer to "Storing the settings permanently with Bootp" on page 58.

Storing the settings permanently with Bootp

If you want to change parameters of the module using the Bootp follow the instructions below.

1. Turn off the module.
2. Change the module's settings of the Configuration Switch to *"Bootp & Store"* mode, see Table 8 on page 49.
3. Start the Agilent Bootp Service and open its window.
4. If required, modify the parameters for the module according to your needs using the existing configuration.
5. Press **OK** to exit the Bootp Manager.
6. Now turn on the module and view the Bootp Server window. After some time the Agilent Bootp Service will display the request from the LAN interface. The parameters are now stored permanently in the non-volatile memory of the module.
7. Close the Agilent Bootp Service and turn off the module.
8. Change the settings of the module's Configuration Switch to *"Using Stored"* mode, see Table 8 on page 49.
9. Power cycle the module. The module can be accessed now via LAN without the Agilent Bootp Service, refer to "Agilent ChemStation Setup" on page 65.

Manual Configuration

Manual configuration only alters the set of parameters stored in the non-volatile memory of the detector. It never affects the currently active parameters. Therefore, manual configuration can be done at any time. A power cycle is mandatory to make the stored parameters become the active parameters, given that the initialization mode selection switches are allowing it.

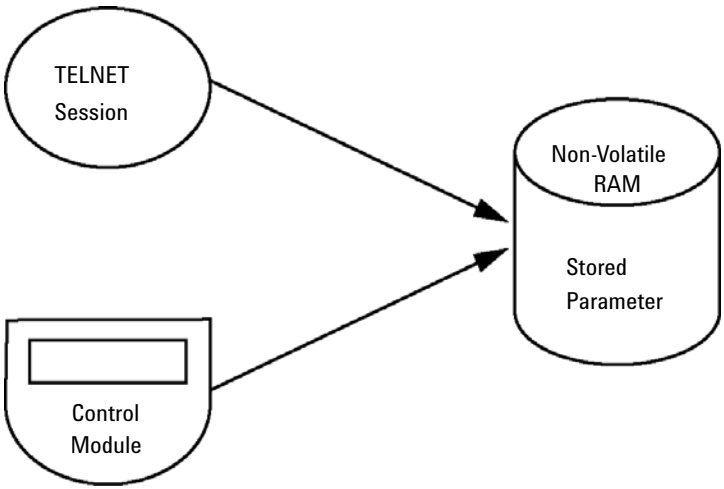


Figure 20 Manual Configuration (Principle)

With Telnet

Whenever a TCP/IP connection to the module is possible (TCP/IP parameters set by any method), the parameters may be altered by opening a Telnet session.

1 Open the system (DOS) prompt window by clicking on Windows **START** button and select **"Run..."**. Type "cmd" and press OK.

2 Type the following at the system (DOS) prompt:

- `c:\>telnet <IP address>`
  or
- `c:\>telnet <host name>`

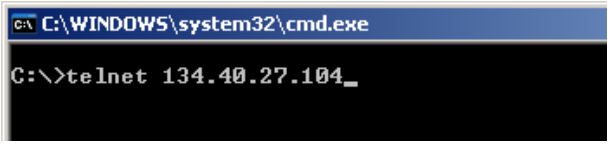


Figure 21 Telnet - Starting a session

where <IP address> may be the assigned address from a Bootp cycle, a configuration session with the Handheld Controller, or the default IP address (see "Configuration Switches" on page 48).

When the connection was established successfully, the module responds with the following:

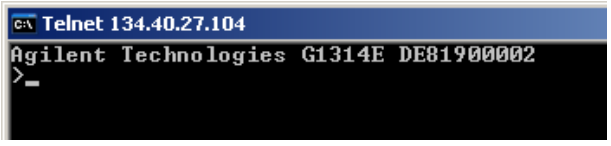


Figure 22 A connection to the module is made

3 Type ? and press enter to see the available commands.

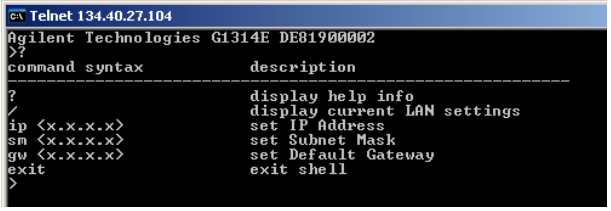


Figure 23 Telnet Commands

Table 11 Telnet Commands

Value	Description
?	displays syntax and descriptions of commands
/	displays current LAN settings
ip <x.x.x.x>	sets new ip address
sm <x.x.x.x>	sets new subnet mask
gw <x.x.x.x>	sets new default gateway
exit	exits shell and saves all changes

4 To change a parameter follows the style:

- parameter value, for example:
  `ip 134.40.27.230`

Then press [Enter], where parameter refers to the configuration parameter you are defining, and value refers to the definitions you are assigning to that parameter. Each parameter entry is followed by a carriage return.

5 Use the "/" and press Enter to list the current settings.

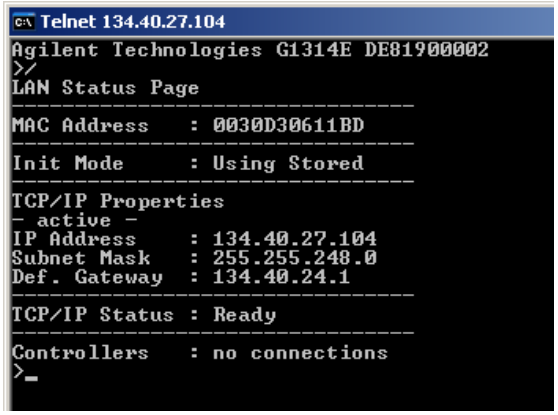


Figure 24 Telnet - Current settings in "Using Stored" mode

6 Change the IP address (in this example 134.40.27.99) and type "/" to list current settings.

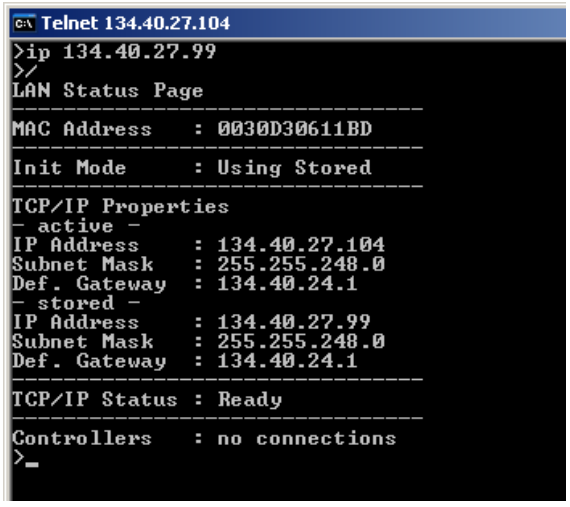


Figure 25 Telnet - Change IP settings

7 When you have finished typing the configuration parameters, type **exit** and press [Enter] to exit with storing parameters.

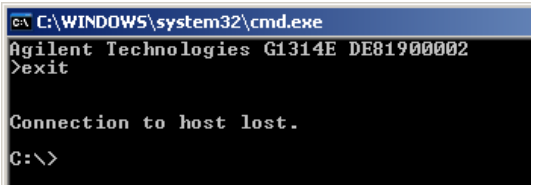


Figure 26 Closing the Telnet Session

NOTE If the Initialization Mode Switch is changed now to "Using Stored" mode, the instrument will take the stored settings when the module is re-booted.

With the Instant Pilot (G4208A)

To configure the TCP/IP parameters before connecting the detector to the network, the Instant Pilot (G4208A) can be used.

1 From the Welcome screen press the **More** button.

2 Select **Configure.**

3 Press the **VWD** (VWD SL) button.

4 Scroll down to the LAN settings.

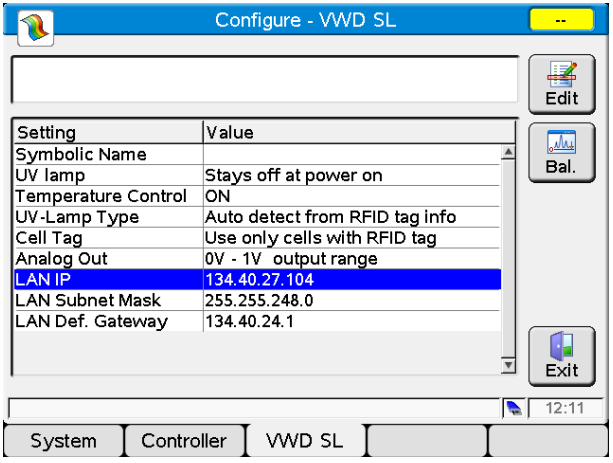


Figure 27 Instant Pilot - LAN Configuration

5 Press the **Edit** button, perform the required changes and press the **Done** button.

6 Leave the screen by pressing the **Exit** button.

PC and Agilent ChemStation Setup

PC Setup for Local Configuration

This procedure describes the change of the TCP/IP settings on your PC to match the module's default parameters in a local configuration (see also Figure 14 on page 51).

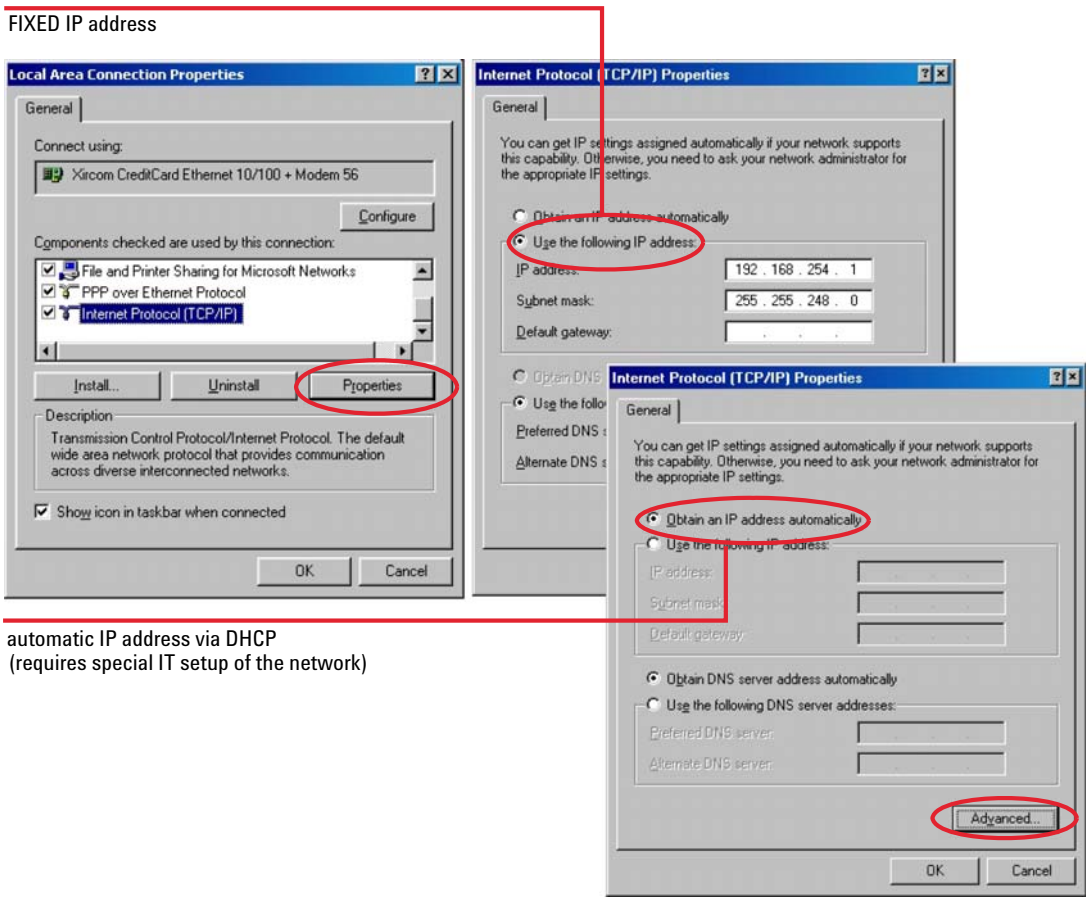

FIXED IP address
Local Area Connection Properties
General
Connect using:
Xircom CreditCard Ethernet 10/100 + Modem 56
Configure
Components checked are used by this connection:
File and Printer Sharing for Microsoft Networks
PPP over Ethernet Protocol
Internet Protocol (TCP/IP)
Install...
Uninstall
Properties
Description
Transmission Control Protocol/Internet Protocol. The default wide area network protocol that provides communication across diverse interconnected networks.
Show icon in taskbar when connected
OK
Cancel
Internet Protocol (TCP/IP) Properties
General
You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.
Use the following IP address:
IP address:
192 . 168 . 254 . 1
Subnet mask:
255 . 255 . 248 . 0
Default gateway:
Internet Protocol (TCP/IP) Properties
General
You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.
Obtain an IP address automatically
Obtain DNS server address automatically
Use the following DNS server addresses:
Preferred DNS server:
Alternate DNS server:
Advanced...
OK
Cancel
automatic IP address via DHCP
(requires special IT setup of the network)

Figure 28 Changing the TCP/IP settings of the PC

Agilent ChemStation Setup

1 Start the Configuration Editor of the Agilent ChemStation.

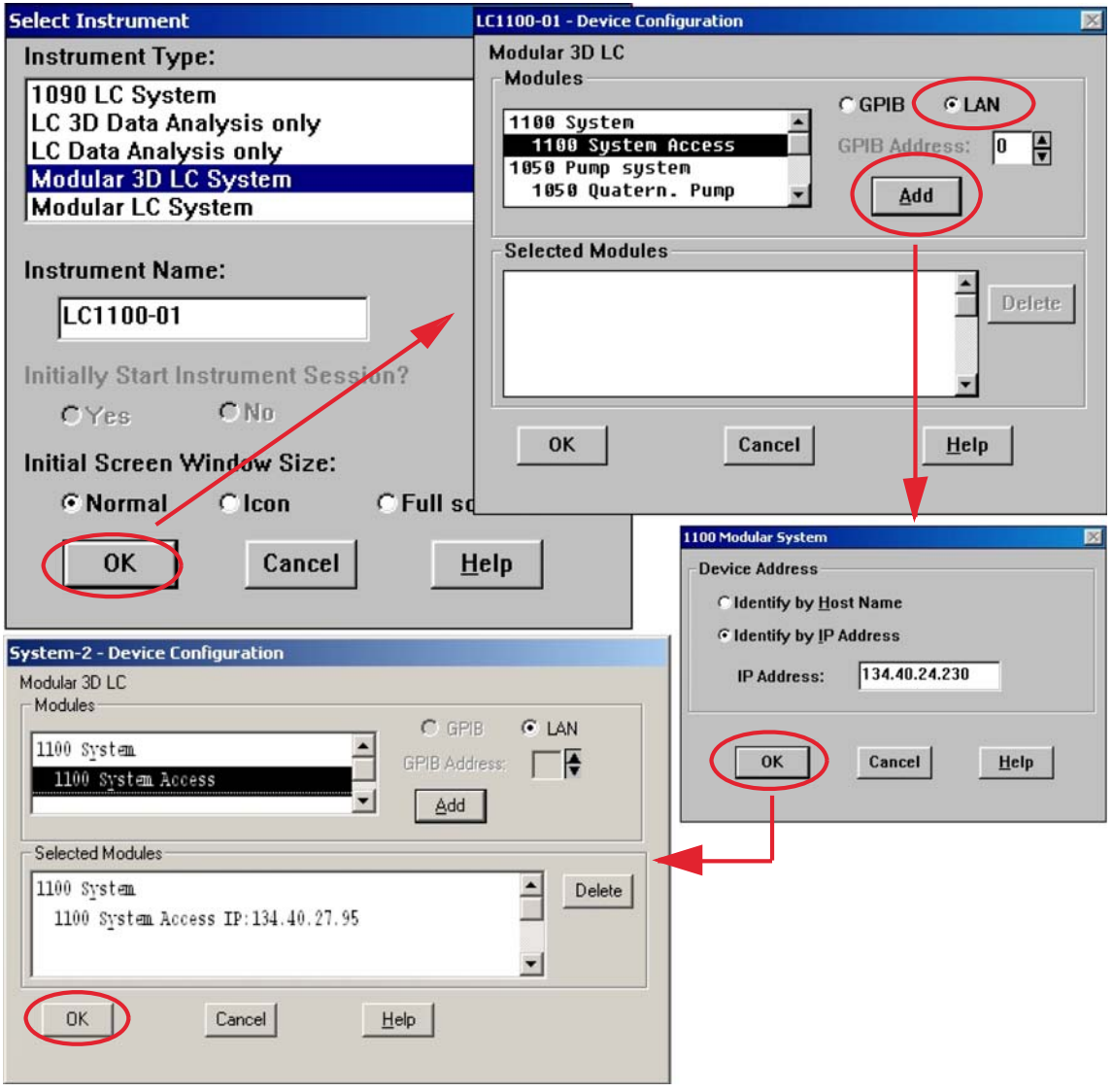


Figure 29 Changing the TCP/IP settings of the Agilent ChemStation

2 Add a TCP/IP connection to communicate with the module. Use the IP address of the module.

NOTE If using a corporate LAN, IP addresses need to be supplied by the responsible IT department. Also the LAN needs to be able to handle additional traffic.

3 Save the configuration, close the Configuration Editor and start the Agilent ChemStation.

5
Using the Detector

Setting up an Analysis 68
Special Settings of the Detector 82

This chapter provides information on how to set up the detector for an analysis and explains the basic settings.

Setting up an Analysis

This chapter can be used for

- preparing the system,
- to learn the set up of an HPLC analysis and
- to use it as an instrument check to demonstrate that all modules of the system are correctly installed and connected. It is not a test of the instrument performance.
- Learn about special settings

Before Using the System

Solvent Information

Observe recommendations on the use of solvents in chapter “Solvents” in the pump’s reference manual.

Priming and Purging the System

When the solvents have been exchanged or the pumping system has been turned off for a certain time (for example, overnight) oxygen will re-diffuse into the solvent channel between the solvent reservoir, vacuum degasser (when available in the system) and the pump. Solvents containing volatile ingredients will slightly lose these. Therefore priming of the pumping system is required before starting an application.

Table 12 Choice of Priming Solvents for Different Purposes

Activity	Solvent	Comments
After an installation	Isopropanol	Best solvent to flush air out of the system
When switching between reverse phase and normal phase (both times)	Isopropanol	Best solvent to flush air out of the system
After an installation	Ethanol or Methanol	Alternative to Isopropanol (second choice) if no Isopropanol is available
To clean the system when using buffers	Bidistilled water	Best solvent to re-dissolve buffer crystals
After a solvent change	Bidistilled water	Best solvent to re-dissolve buffer crystals
After the installation of normal phase seals (P/N 0905-1420)	Hexane + 5% Isopropanol	Good wetting properties

NOTE The pump should never be used for priming empty tubings (never let the pump run dry). Use a syringe to draw enough solvent for completely filling the tubings to the pump inlet before continuing to prime with the pump.

1. Open the purge valve of your pump (by turning it counterclockwise) and set flow rate to 3-5 ml/min.
2. Flush all tubes with at least 30 ml of solvent.
3. Set flow to required value of your application and close the purge valve.

NOTE Pump for approximately 10 minutes before starting your application.

Requirements and Conditions

What You Will Need

The table below lists the items you need to have for the set up of the analysis. Some of these are optional (not required for the basic system).

Table 13 What you will need

1200 system	Pump (plus degassing)
	Autosampler
	Detector, standard flow cell installed
	Degasser (optional)
	Column Compartment (optional)
	Agilent ChemStation (B.03.02 SR1 or later) or Instant Pilot G4208 (B.02.07 or later), optional for basic operation.
	System should be correctly set up for LAN communication with the Agilent ChemStation
Column:	Zorbax Eclipse XDB-C8, 4.6 x 150 mm, 5 µm, Part No. 993967-906
Standard:	Part No. 01080-68704 0.15 wt.% dimethylphthalate, 0.15 wt.% diethylphthalate, 0.01 wt.% biphenyl, 0.03 wt.% o-terphenyl in methanol

Conditions

A single injection of the isocratic test standard is made under the conditions given in Table 14 on page 70:

Table 14 Conditions

Flow	1.5 ml/minute
Stoptime	8 minutes
Solvent	100% (30% water/70% Acetonitrile)
Temperature	Ambient
Wavelength	sample 254 nm

Table 14 Conditions

Injection Volume	1 µl
Column Temperature (optional):	25.0°C or ambient

Typical Chromatogram

A typical chromatogram for this analysis is shown in Figure 30 on page 71. The exact profile of the chromatogram will depend on the chromatographic conditions. Variations in solvent quality, column packing, standard concentration and column temperature will all have a potential effect on peak retention and response.

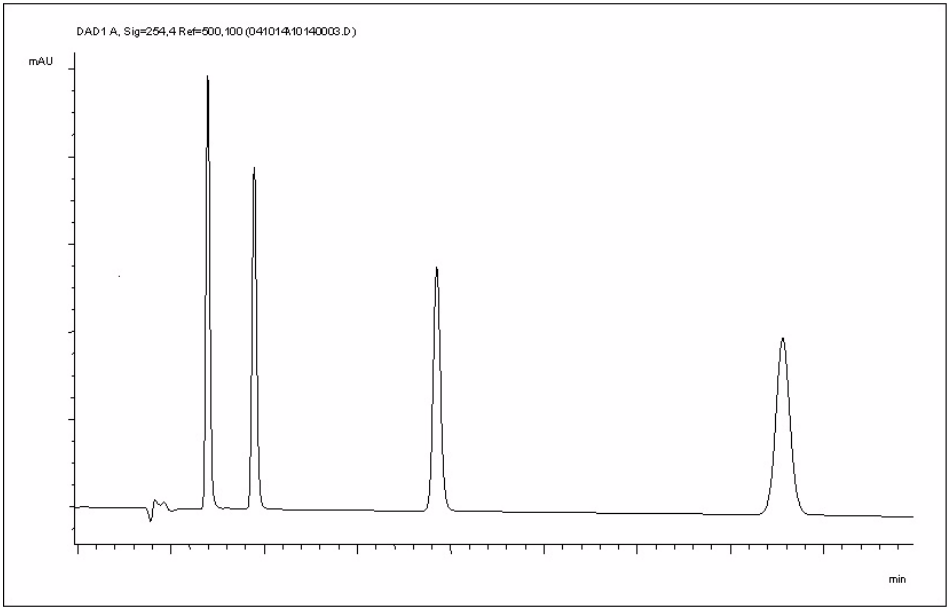


Figure 30 Typical Chromatogram with UV-detector

Optimization of the System

The settings used for this analysis are specific for this purpose. For other applications the system can be optimized in various ways. Please refer to the section “Optimizing the Detector Performance” on page 94.

Preparing the HPLC System

1 Turn on the Agilent ChemStation PC and the monitor.

2 Turn on the 1200 series HPLC modules.

3 Start the Agilent ChemStation software. If the pump, autosampler, thermostatted column compartment and detector are found, the ChemStation screen should look like shown in the figure below. The System status is red (Not Ready).

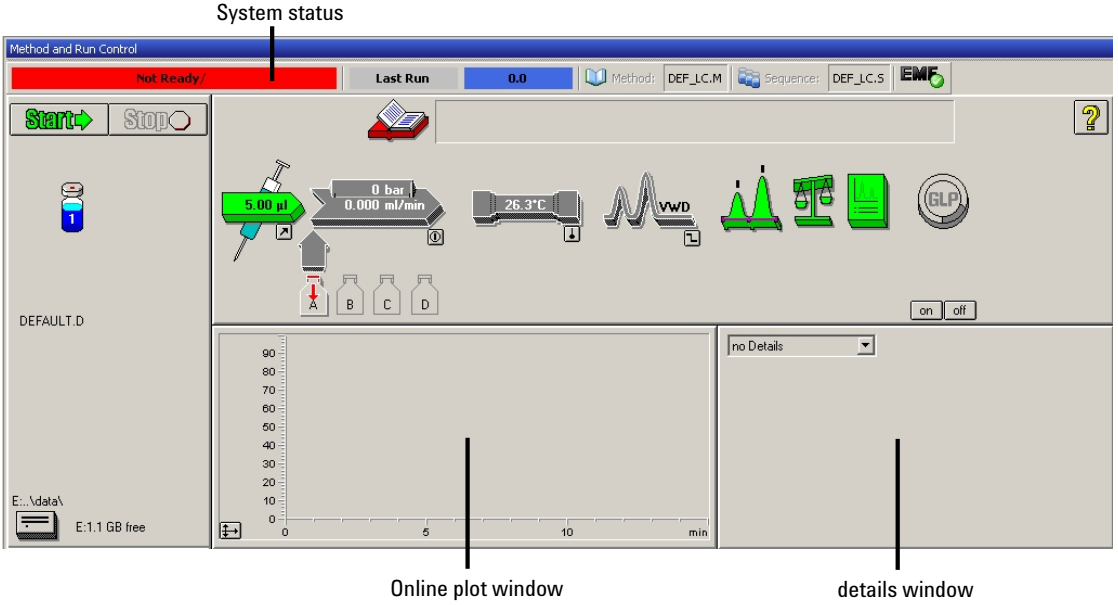


Figure 31 Initial ChemStation screen (Method and Run Control)

4 Turn on the detector lamp, pump and autosampler by clicking the **System On** button or the buttons below the module icons on the graphical user interface (GUI).

After some time, the pump, thermostatted column compartment and detector module will turn to green.

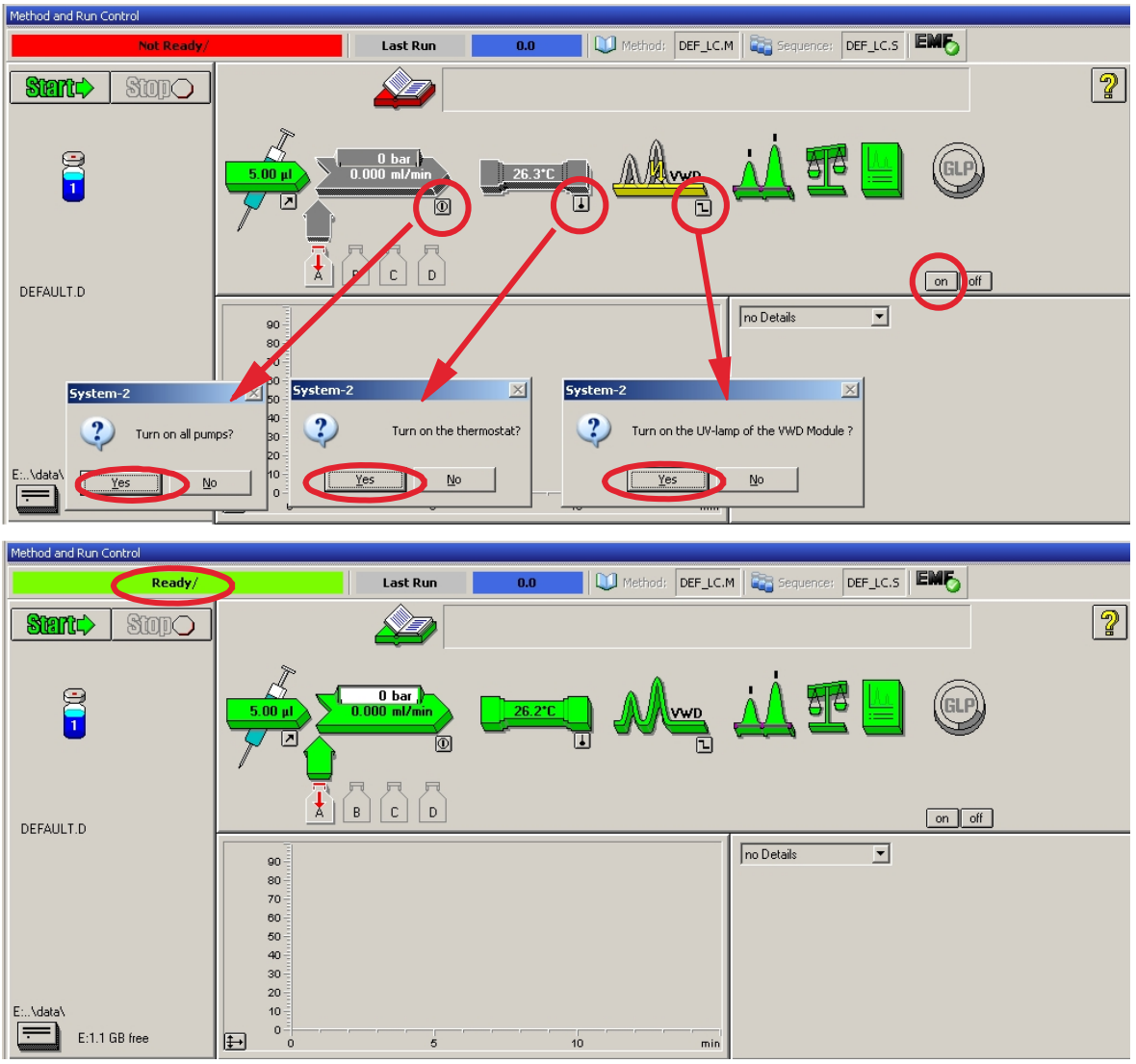


Figure 32 Turning on the HPLC Module

5 Purge the pump. For more information “Priming and Purging the System” on page 68.

6 Allow the detector to warm up of at least 60 minutes to provide a stable baseline (example: Figure 33 on page 74).

NOTE For reproducible chromatography, the detector and lamp should be on for at least one hour. Otherwise the detector baseline may still drift (depending on the environment).

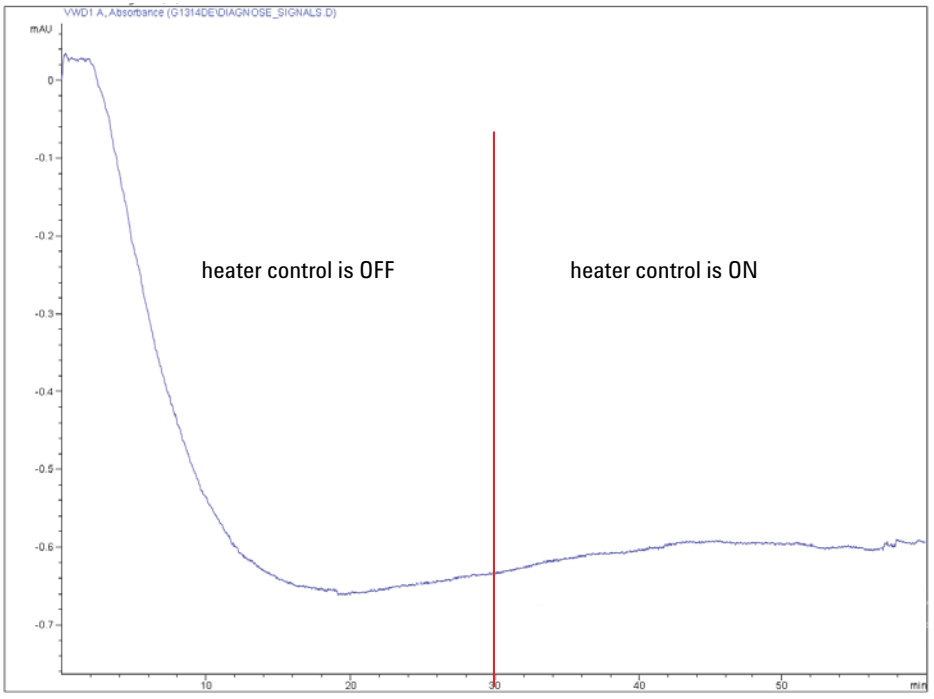


Figure 33 Stabilization of baseline after turn on of detector

7 For the isocratic pump, fill the solvent bottle with the mixture of HPLC-grade bi-distilled water (30 %) and acetonitrile (70 %). For binary- and quaternary pumps you can use separate bottles.

8 Click on the **Load Method** button and select **DEF_LC.M** and press **OK**. Alternative double-click on the method in the method window. The default LC method parameters are transferred into the 1200 modules.

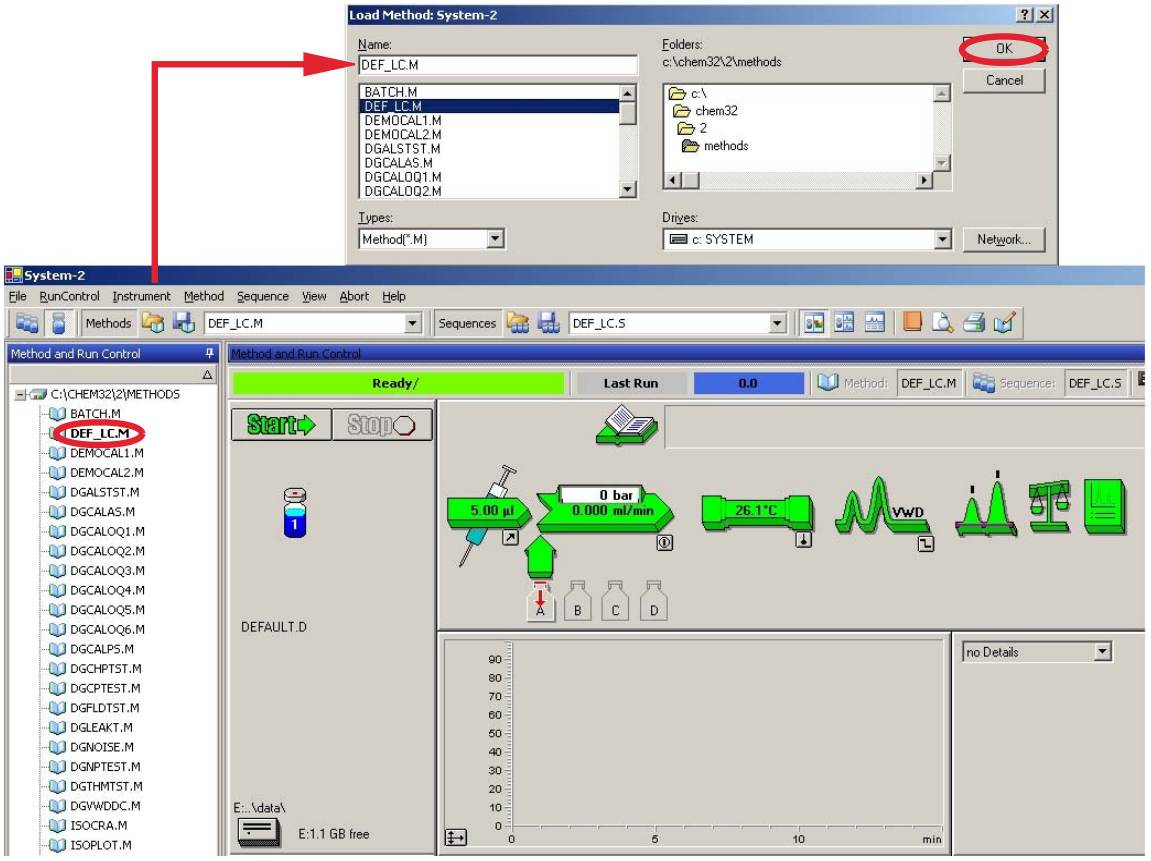


Figure 34 Loading Default LC Method

9 Click on the module icons (Figure 35 on page 76) and open the **Setup** of these modules. Figure 36 on page 77 shows the detector settings (do not change the detector parameters at this time).

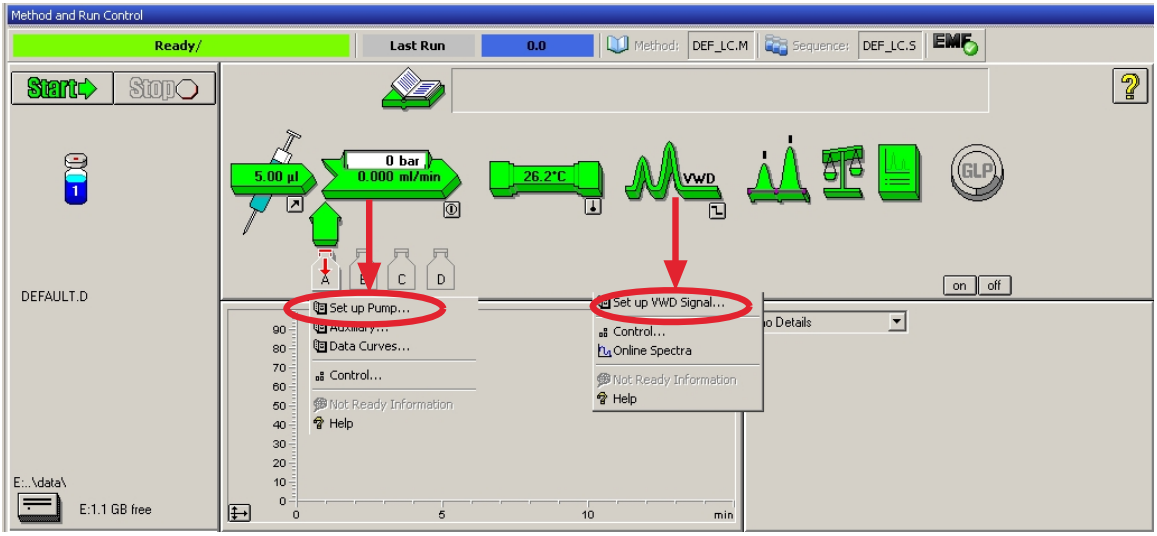
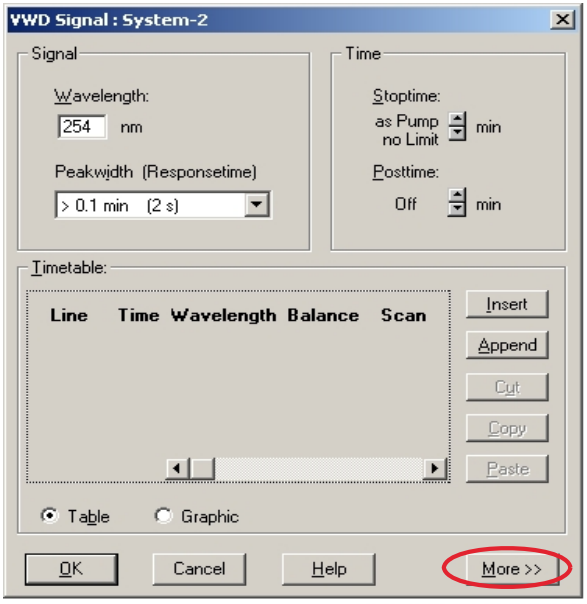
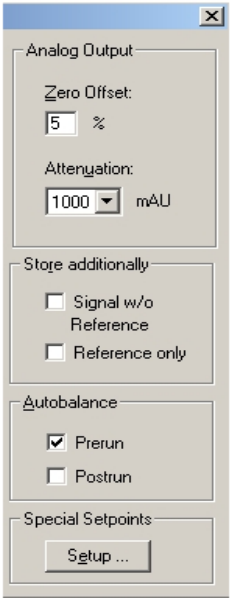


Figure 35 Open the module menu

10 Enter the pump parameters mentioned under Table 14 on page 70.



- 1 signal with individual wavelength setting
- stop and post time can be set (if required)
- peakwidth depends on the peaks in the chromatogram, see "Peakwidth Settings" on page 91.
- time table for programmable actions during the run



- Zero Offset Limits: 1 to 99 % in steps of 1 %
- Attenuation Limits: 0.98 to 4000 mAU at discrete values for either 100 mV or 1 V full scale
- additional signals can be stored with the normal signal (for diagnostics)
- autobalance to zero absorbance (on the analog output plus offset) at begin and/or end of run
- see "Special Setpoints" on page 90.

Figure 36 Detector Settings (default)

11 Pump the water/acetonitrile (30/70 %) mobile phase through the column for 10 minutes for equilibration.

12 Click the button and select **Change...** to open the Signal Plot information. Select the **Pump: Pressure** and the **VWD A: Signal 254** as signals. Change the Y-range for the VWD to 1 mAU and the offset to 20 % and the pressure offset to 50 %. The X-axis range should be 15 minutes. Press **OK** to exit this screen.

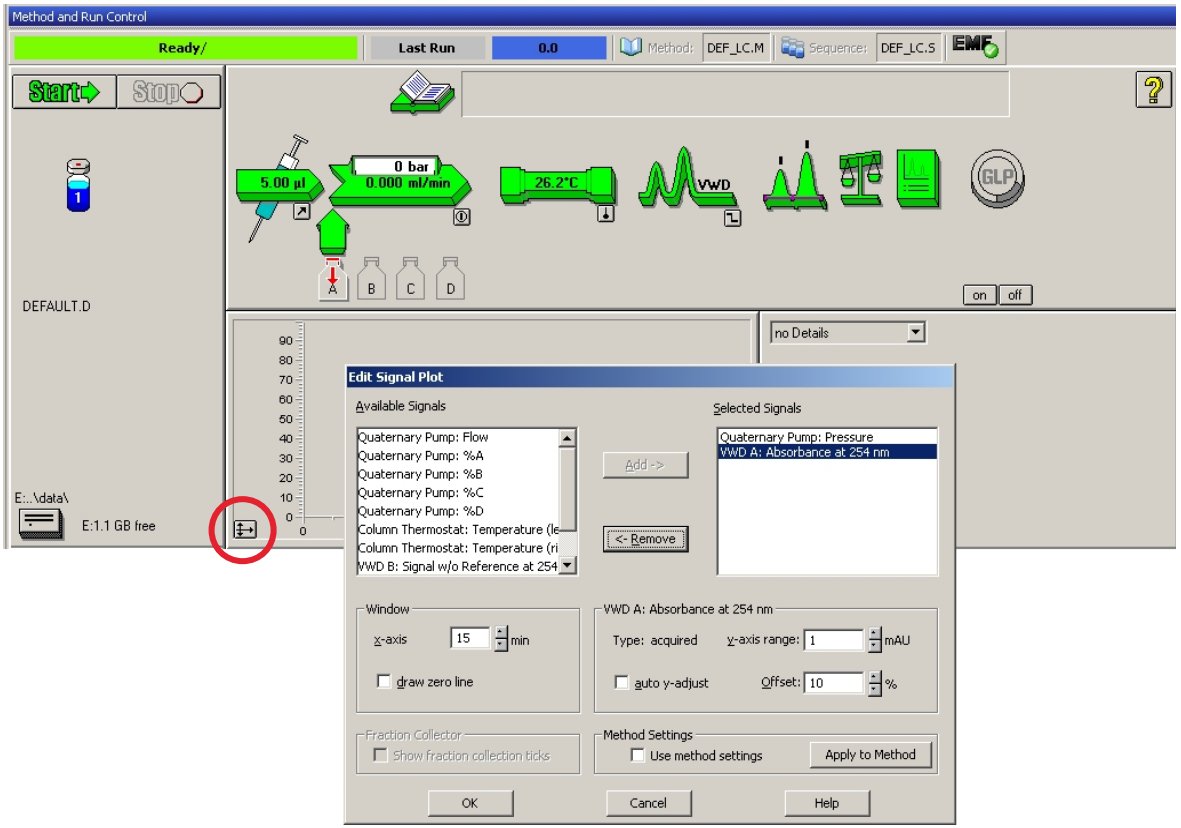


Figure 37 Edit Signal Plot Window

The Online Plot (Figure 38 on page 79) shows both, the pump pressure and the detector absorbance signals. Pressing **Adjust** the signals can be reset to the offset value and **Balance** would do a balance on the detector.

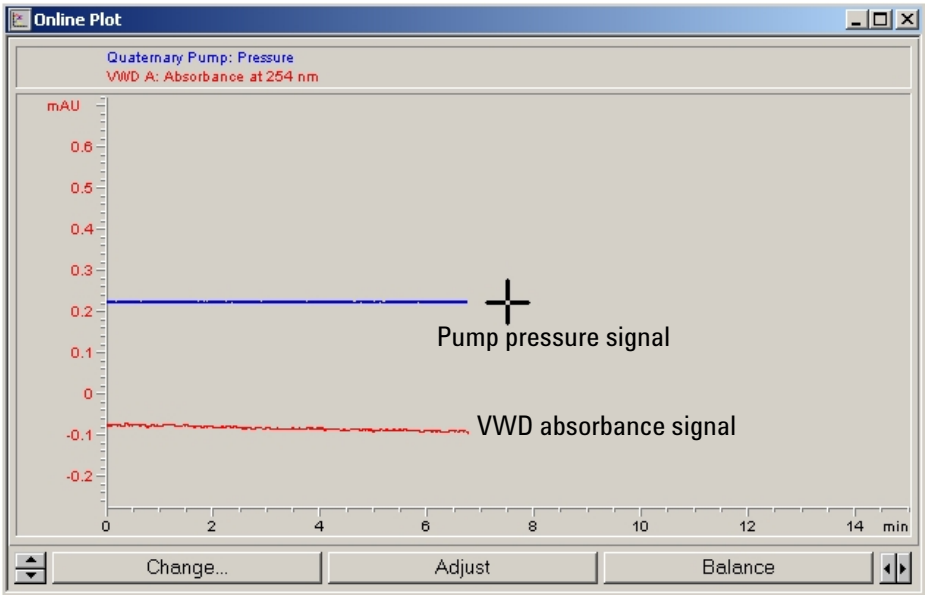


Figure 38 Online Plot Window

13 If both baselines are stable, set the Y-range for the detector signal to 100 mAU.

NOTE If you start with a new UV-lamp for the first time, the lamp may show initial drift for some time (burn-in effect).

14 Select the menu item **RunControl** > **Sample Info** and enter information about this application (Figure 39 on page 80). Press **OK** to leave this screen.

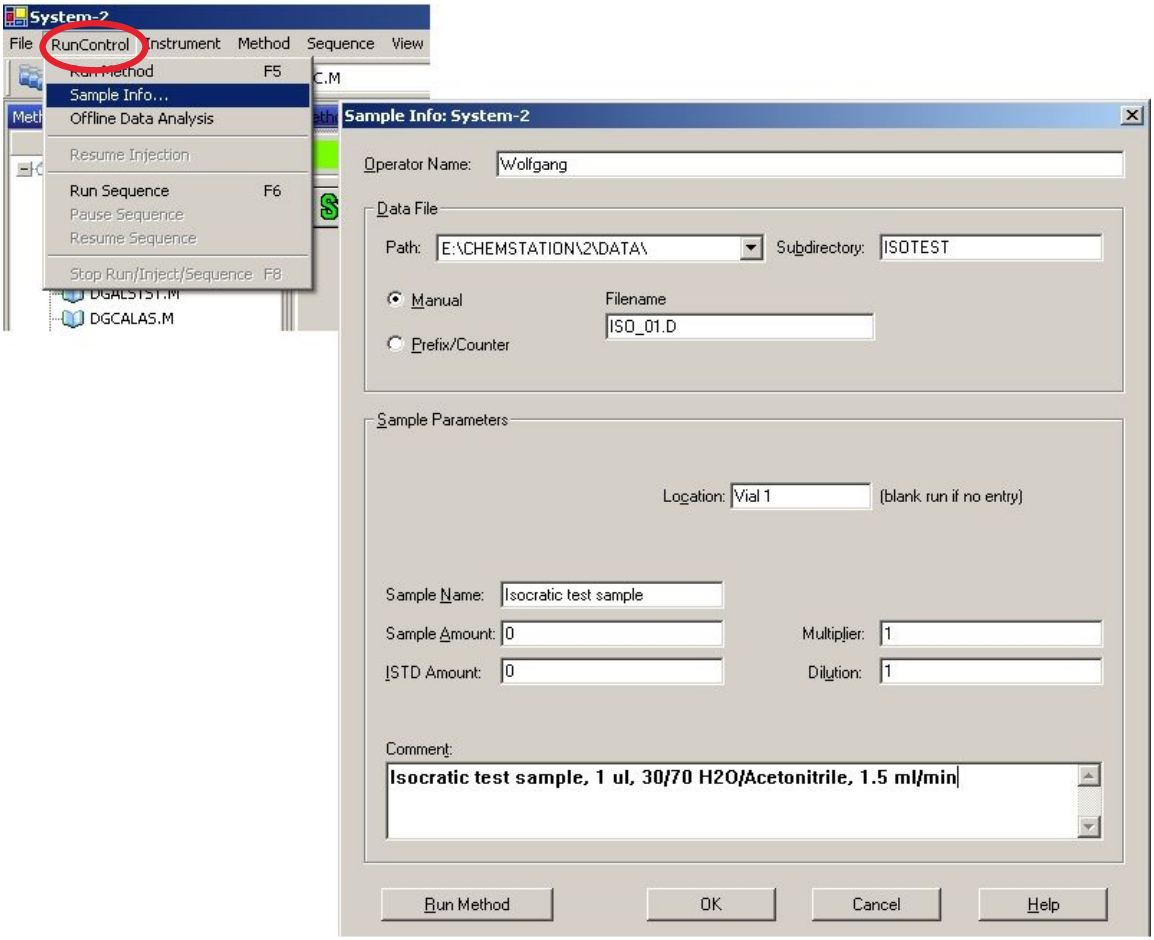


Figure 39 Sample Information

15 Fill the content of an isocratic standard sample ampoule into a vial and seal the vial with a cap and place the vial into autosampler tray (position #1).

Running the Sample and Verifying the Results

1 To start a run select the menu item **RunControl** > **Run Method**.

2 This will start the 1200 modules and the online plot on the Agilent ChemStation will show the resulting chromatogram.

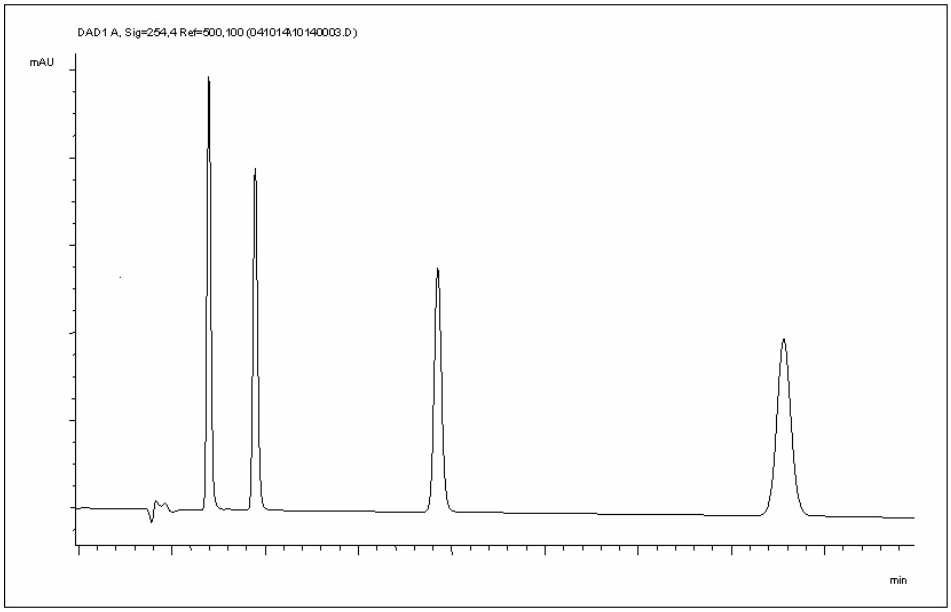


Figure 40 Chromatogram with Isocratic Test Sample

NOTE Information about using the Data Analysis functions can be obtained from the Using your ChemStation manual supplied with your system.

Special Settings of the Detector

In this chapter special settings of the G1314D VWD and G1314E VWD SL Plus are described.

Control Settings

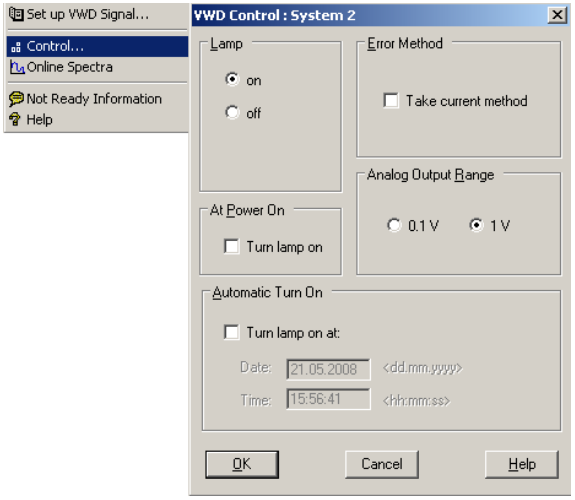
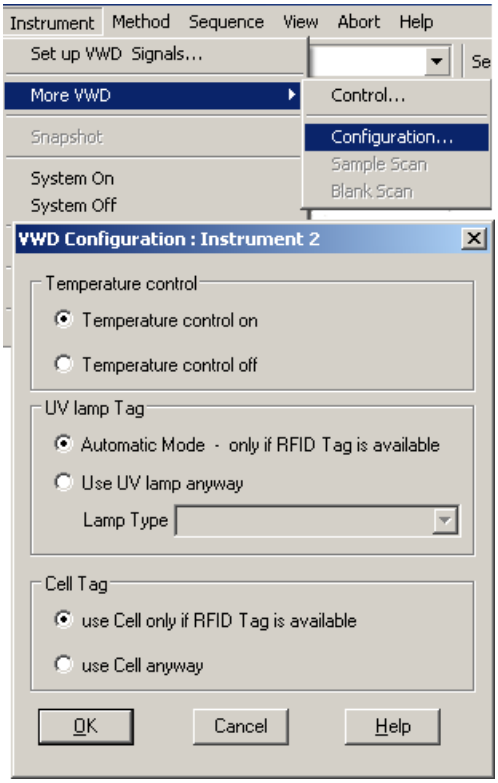


Figure 41 Detector control settings

- *Lamp:* turn on and off of UV-lamp.
- *At Power On:* automatic lamp-on at power on.
- *Error Method:* take error method or current method (in case of an error).
- *Analog Output Range:* can be set to either 100 mV or 1 V full scale, see "Analog Output Settings" on page 89.
- *Automatic Turn On:* lamps can be programmed (detector must be on for this).
- *Help:* online help.

Configuration Settings



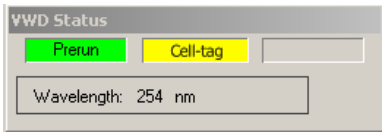


Figure 42 Detector Configuration Settings

- **Temperature Control**: the optical unit is kept on constant temperature (some degrees above ambient) and improves the baseline stability in unstable environments. See also note below.
- **UV lamp tag**: Automatic mode for Agilent lamps with RFIDtags. If no RFID tag lamp is used, detector icon will become gray (lamp tag not ready) and analysis is disabled.

  The specifications are based on the lamp with RFID tag.

  Use UV lamp anyway - here you can select non-RFID tag lamps, such as of type VWD lor DAD (have different heating mechanismn).

  The correct selection is important for optimal performance and lifetime.
- **Cell tag**: for Agilent flow cells with RFID tags. If no RFID tag cell is used, detector icon will become gray (cell tag not ready) and analysis is disabled.
- **Help**: online help.

The detector status shows “Cell-tag” in yellow in case the flow cell with the RFID tag is not inserted. The detector icon is gray and the system is not ready.

NOTE If the flow cell temperature is critical for your chromatography or your environment is stable, you may set the Temperature Control to off. This will lower the optical unit and flow cell temperature by some degree.

Online Spectra

1 To view the online spectra select Online Spectra.

NOTE This online spectrum is taken during a stop-flow condition only while the peak is kept in the flow cell, see "Scanning with the VWD" on page 85.

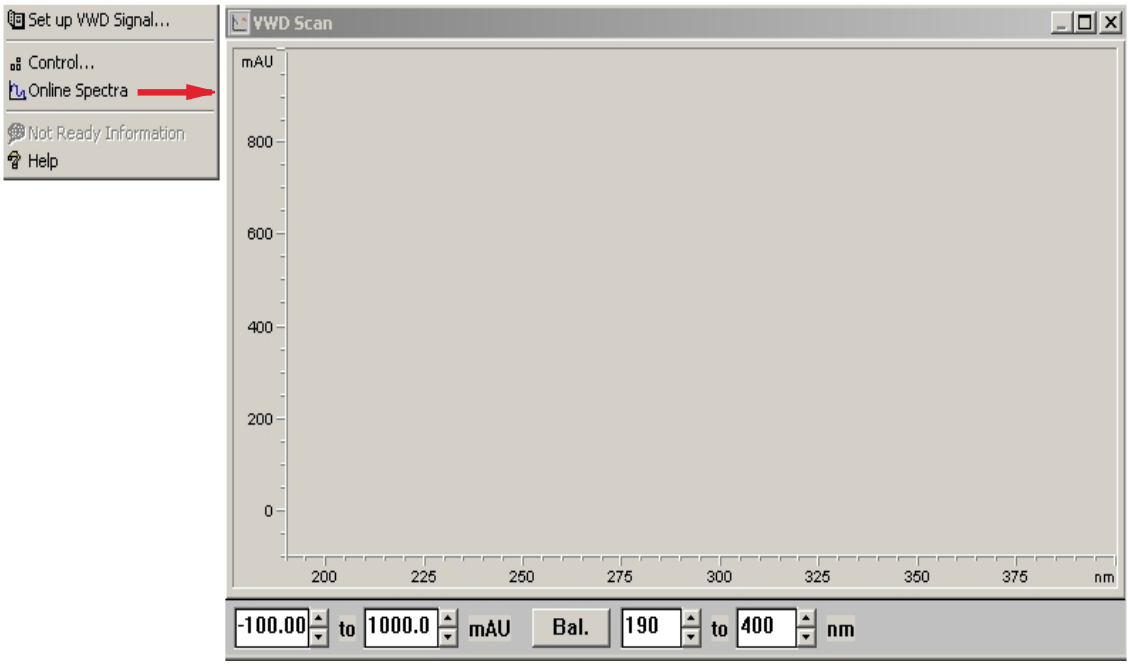


Figure 43 Online Spectra Window

2 Change the absorbance and wavelength range according your needs.

Scanning with the VWD

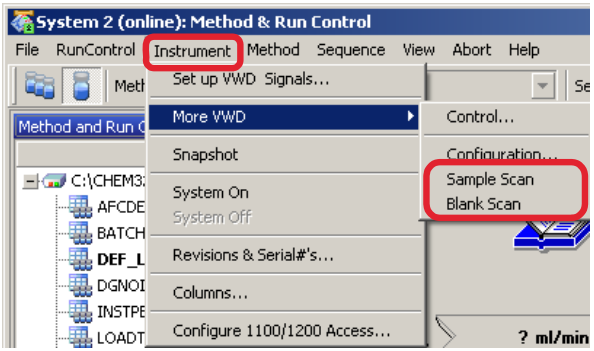
NOTE Access to the scan feature is only possible during run.

1 Set up a run.

2 Start a run.

3 While running on the baseline, select from the menu **Instrument** > **More VWD** > **Blank Scan**.

A background scan is stored in the memory.



- *Step 1: Blank Scan:* scan of the background (solvent) is stored in the memory.
- *Step 2: Sample Scan:* scan of the peak of interest is taken while the peak stays in the flow cell (stop-flow condition).
- *Online Spectrum:* Sample Scan minus Blank Scan.

4 When the peak of interest enters the flow cell, stop the flow (set flow rate to zero or open the purge valve) and wait a few moments to stabilize the concentration.

NOTE Turning off the pump would stop the run and no access to the sample scan is possible.

5 Select from the menu **Instrument** > **More VWD** > **Sample Scan**.

A sample scan is taken in the range defined under "Special Setpoints" on page 90 and the Online Spectra window (see "Online Spectra" on page 84) displays the result (Sample Scan minus Blank Scan).

Run Recovery (G1314E only)

NOTE This feature is not supported with ChemStation B.03.02 SR1. It will be implemented with ChemStation B.04.01. The figures used in this chapater are from the G1315C DAD SL. The G1314E VWD SL figures will look the same.

Run Recovery Settings

CAUTION For this recovery mode the CompactFlash Card must be in the detector.

If the LAN communiaction is interruppted, no data is stored.

➔ Have the CompactFlash Card always inserted.

The detector supports run buffering, which means that an amount of run data (*.uv and *.ch files) is stored in a storage medium (CompactFlash Card) in the detector until either it is overwritten or the detector undergoes a power cycle.

If there is a temporary network failure or the PC is not able to constantly take the data, the stored data is transferred to the ChemStation automatically when the network connection is restored or the PC can take the data, so that no loss of data occurs.

If there is a permanent network failure, the Run Recovery dialog box allows you to restore the stored data to the data directory. From there you can copy the files to the directory where the files are corrupted or not complete.

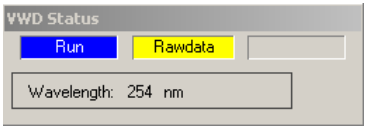
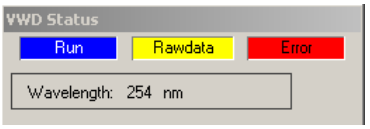
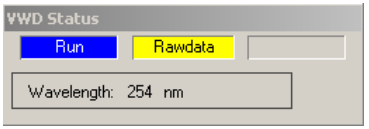
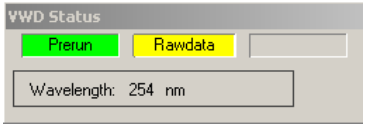
NOTE On very large recovery files it may take a long time to restore it to the Agilent ChemStation.

A sequence will be stopped in case of a network problem.

NOTE When during recovery an error “Method/Sequence stopped” appears, the instrument logbook shows an entry “No Run data available in device“.

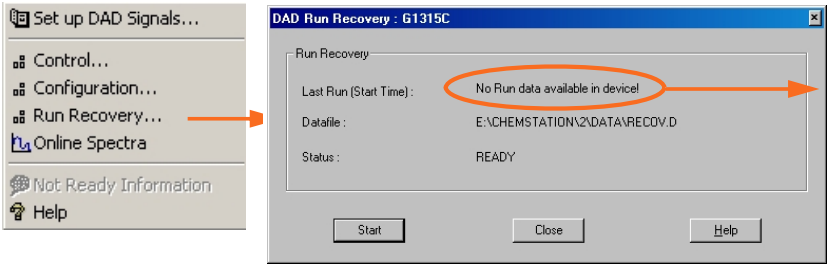
Automated Run Recovery in case of temporary communication failures

Table 15 Automated Run Recovery in case of temporary communication failures

Situation	Reaction	On ChemStation
All OK	• Run in progress - Data Analysis • Run / Rawdata • Elapsed run time is running • Spectra counter is running • Data are stored on PC and on card	
LAN breaks	• Run in progress - Data Analysis • Run / Rawdata • Error Power Fail • Elapsed run time stops • Spectra counter stops • Data continues to be stored on card	
LAN recovers	• Run in progress - Data Analysis • Run / Rawdata • Error Power Fail cleared • Elapsed run time continues at actual time • Spectra counter continues • Data continues to be stored on PC and on card • ChemStation tries already to add missing data (depends on the data load).	
Stop time elapsed	• Run in progress - Data Analysis • Prerun / Rawdata • Elapsed run time stops • Spectra counter continues • ChemStation continues to add missing data	
Run ends	• Ready • Run finished • Prerun / Ready	

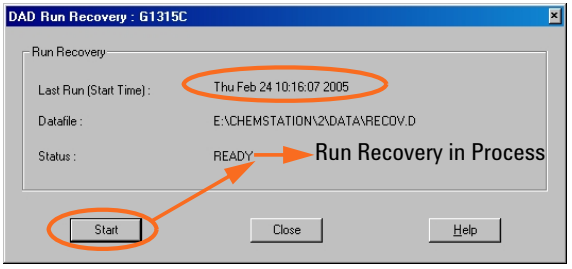
NOTE If the detector status window is not opened, you will realize only the Power Fail error and the long Run In Progress information until the data is recovered from disk.

Manual Run Recovery in case of permanent communication failures

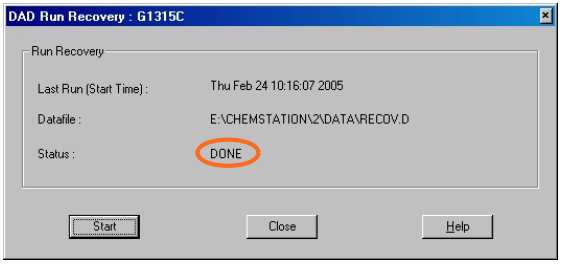


see Note below

Start a recover



After a recover

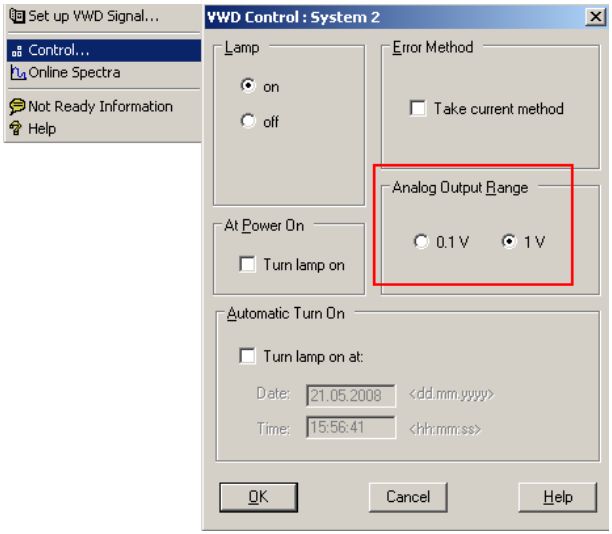


NOTE When during recovery an error “Method/Sequence stopped” appears, the instrument logbook shows an entry “No Run data available in device“.

Analog Output Settings

1 To change the Output Range of the analog outputs select **VWD Control**.

2 To change the offset and the attenuation select **VWD Signal** > **More**.



- *Analog Output Range:* can be set to either 100 mV or 1 V full scale.
- *Zero Offset:*can be set to either 100 mV or 1 V full scale.
- *Attenuation Limits:* 0.98 to 4000 mAU at discrete values for either 100 mV or 1 V full scale.

Figure 44 Analog Output Settings

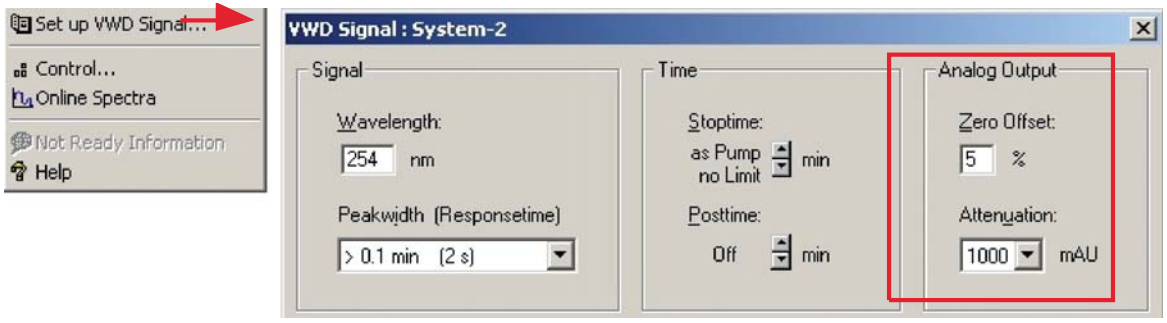
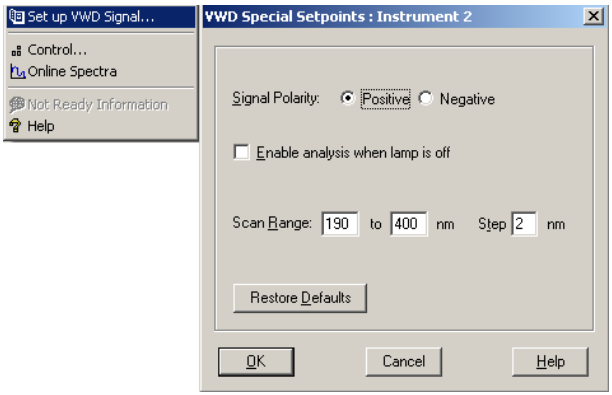


Figure 45 Analog Output Settings

3 Change the values if required.

Special Setpoints

1 To change the offset and the attenuation select **VWD Signal** > **More** > **Special Setpoints**.



- *Signal Polarity:* can be switched to negative (if required).
- *Enable analysis when lamp is off:* if the VWD is not used in a dual detector setup (lamp off), the not-ready condition is not stopping the analysis.
- *Scan Range / Step:* Used for stop-flow scanning, see "Scanning with the VWD" on page 85.

Figure 46 Special Setpoints

Peakwidth Settings

NOTE Do not use peak width shorter than necessary, see details below.

1 To change the Peakwidth settings select **Setup Detector Signals**.
2 In the section Peakwidth (Responsetime) click on the drop-down list.
3 Change the Peakwidth according to your needs.

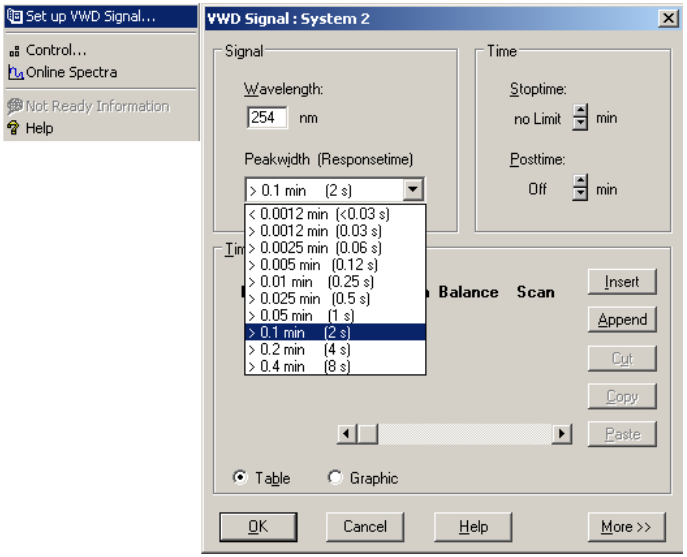


Figure 47 Peakwidth Setting

Peakwidth enables you to select the peak width (response time) for your analysis. The peak width is defined as the width of a peak, in minutes, at half the peak height. Set the peak width to the narrowest expected peak in your chromatogram. The peak width sets the optimum response time for your detector. The peak detector ignores any peaks that are considerably narrower, or wider, than the peak width setting. The response time is the time between 10 % and 90 % of the output signal in response to an input step function. When the All spectrum storage option is selected, then spectra are acquired continuously depending on the setting of the peak width. The time specified by the peak width is used as a factor in the acquisition of spectra. The acquisition time for one spectrum is slightly less than the peak width divided by 8, see Table 16 on page 92 and Table 17 on page 92.

Limits: When you set the peak width (in minutes), the corresponding response time is set automatically and the appropriate data rate for signal acquisition is selected as shown in Table 16 on page 92 and Table 17 on page 92.

Table 16 Peak Width – Response Time – Data Rate (G1314D VWD)

peakwidth at half heigth [min]	Response Time [s]	Data Rate [Hz]
<0.005	<0.12	20
>0.005	0.12	20
>0.01	0.25	20
>0.025	0.5	20
>0.05	1.0	10
>0.10	2.0	5
>0.20	4.0	2.5
>0.40	8.0	1.25

Table 17 Peak Width – Response Time – Data Rate (G1314E VWD SL Plus)

peakwidth at half heigth [min]	Response Time [s]	Data Rate [Hz]
<0.0012	<0.03	160
>0.0012	0.03	160
>0.0025	0.06	160
>0.005	0.12	80
>0.0125	0.25	40
>0.025	0.5	20
>0.05	1.0	10
>0.10	2.0	5
>0.20	4.0	2.5
>0.40	8.0	1.25

6
How to optimize the detector

Optimizing the Detector Performance 94
Match the Flow Cell to the Column 95
Set the Detector Parameters 99

This chapter gives hints on how to select the detector parameters and the flow cell.

Optimizing the Detector Performance

The detector has a variety of parameters that can be used to optimize performance.

The information below will guide you on how to get the best detector performance. Follow these rules as a start for new applications. It gives a rule-of-thumb for optimizing the detector parameters.

Match the Flow Cell to the Column

The tables below recommend the flow cell that matches the column used. If more than one selection is appropriate, use the larger flow cell to get the best detection limit. Use the smaller flow cell for best peak resolution.

Standard HPLC Applications

Column length	Typical peak width	Recommended flow cell				
<= 5 cm	0.025 min	Micro flow cell	Semimicro flow cell	Standard flow cell		High Pressure flow cell
10 cm	0.05 min					
20 cm	0.1 min					
>= 40 cm	0.2 min					
	Typical flow rate	0.05-0.2 ml/min	0.2- 0.4 ml/min	0.4- 0.8 ml/min	1-2 ml/min	0.01- 5 ml/min
	Internal column diameter	1.0 mm	2.1mm	3.0 mm	4.6 mm	

Figure 48 Choosing a Flow Cell (Standard HPLC Applications)

Ultra fast separation with RRLC systems

Column ID	2.1 mm	3.0 mm	4.6 mm
Configuration	No damper No mixer ++	Damper Mixer	Damper Mixer
Flow cell	2 µl, 3 mm	5 µl, 6 mm +	14 µl, 10 mm +

Figure 49 Choosing a Flow Cell for G1314E (for ultra fast separation with RRLC systems)

- (+) For ultra fast analysis with step gradients the micro flow cell (2 µl 3 mm) gives the best performance
- (++) In high resolution analysis time is not the highest priority. Higher delay volumes are accepted. Therefore we recommend to use the damper plus mixer for a highest signal to noise.
- If longer columns (> 50 mm) for higher resolution are used, then the next larger flow cell is the preferred choice for higher sensitivity.

Flow Cell Path Length

Lambert-Beer's law shows a linear relationship between the flow cell path length and absorbance.

$$\text{Absorbance} = -\log T = \log\frac{I_0}{I} = \varepsilon \cdot C \cdot d$$

where

T	is the transmission, defined as the quotient of the intensity of the transmitted light I divided by the intensity of the incident light, I_0,
e	is the extinction coefficient, which is a characteristic of a given substance under a precisely-defined set of conditions of wavelength, solvent, temperature and other parameters,
C	is the concentration of the absorbing species (usually in g/l or mg/l),
d	is the path length of the cell used for the measurement.

Therefore, flow cells with longer path lengths yield higher signals. Although noise usually increases little with increasing path length, there is a gain in signal-to-noise ratio. For example, in Figure 50 on page 97 the noise increased by less than 10 % but a 70 % increase in signal intensity was achieved by increasing the path length from 6 mm to 10 mm.

When increasing the path length, the cell volume usually increases – in our example from 5 – 13 µl. Typically, this causes more peak dispersion. As Figure 50 on page 97 demonstrates, this did not affect the resolution in the gradient separation in our example.

As a rule-of-thumb the flow cell volume should be about 1/3 of the peak volume at half height. To determine the volume of your peaks, take the peak width as reported in the integration results multiply it by the flow rate and divide it by 3).

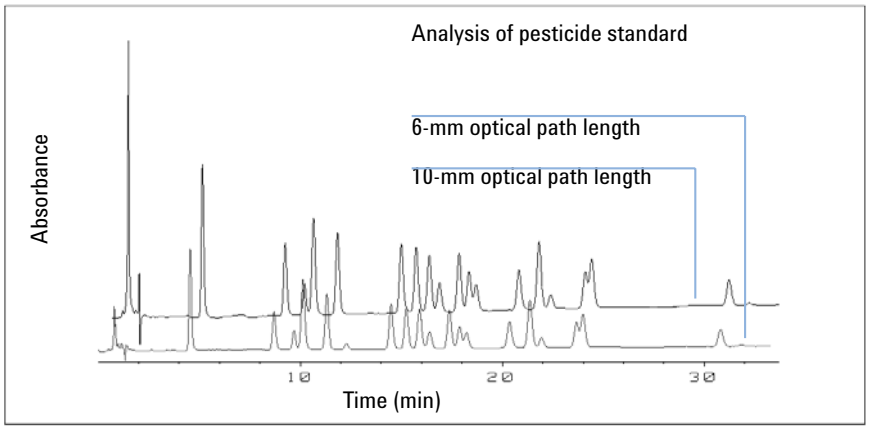


Figure 50 Influence of Cell Path Length on Signal Height

Traditionally LC analysis with UV detectors is based on comparing measurements with internal or external standards. To check photometric accuracy of the Agilent 1200 Series VWD it is necessary to have more precise information on path lengths of the VWD flow cells.

The correct response is:

expected response * correction factor

Please find below the details of the Agilent 1200 Series VWD flow cells:

Table 18 Correction factors for Agilent VWD flow cells (G1314D/G1314E)

Flow cell type (with RFID tag)	Cell volume	Part number	Path length (nominal)	Path length (actual)	Correction factor
Standard flow cell	14 µl	G1314-60186	10 mm	10.15 ± 0.19 mm	10/10.15
Semi-micro flow cell	5 µl	G1314-60183	6 mm	6.10 ± 0.19 mm	6/6.10
Micro flow cell	2 µl	G1314-60187	3 mm	2.80 ± 0.19 mm	3/2.8
High Pressure flow cell	14 µl	G1314-60182	10 mm	10.00 ± 0.19 mm	6/5.75

NOTE However you have to be aware that there are additional tolerance of gasket thickness and its compression ratio which is supposed to be very small in comparison with the machining tolerance.

Set the Detector Parameters

1 Set peakwidth as close as possible to the width (at half height) of a narrow peak of interest. Refer to "Peakwidth Settings" on page 91.

2 Choose the sample wavelength.

- at a longer wavelength than the cut-off wavelength of the mobile phase,
- at a wavelength where the analytes have strong absorptivity if you want to get the lowest possible detection limit,
- at a wavelength with moderate absorptivity if you work with high concentrations, and
- preferably where the spectrum is flat for better linearity.

3 Consider to use time-programming to further optimization.

7
Troubleshooting and Diagnostics

Overview of the Detector's Indicators and Test Functions 102
Status Indicators 103
Available Tests versus Interfaces 105
Agilent Diagnostic Software 106

Overview about the troubleshooting and diagnostic features.

Overview of the Detector's Indicators and Test Functions

Status Indicators

The detector is provided with two status indicators which indicate the operational state (prerun, run, and error states) of the detector. The status indicators provide a quick visual check of the operation of the detector "Status Indicators" on page 103.

Error Messages

In the event of an electronic, mechanical or hydraulic failure, the detector generates an error message in the user interface. For each message, a short description of the failure, a list of probable causes of the problem, and a list of suggested actions to fix the problem are provided by the user interface. Refer to the Service Manual for details.

Test Functions

A series of test functions are available for troubleshooting and operational verification after exchanging internal components. Refer to the User Interface and/or the Service Manual for details.

Wavelength Verification / Recalibration

Wavelength recalibration is recommended after repair of internal components, and on a regular basis to ensure correct operation of the detector. The detector uses the deuterium alpha and beta emission lines for wavelength calibration, see "Wavelength Verification/Calibration" on page 128.

Diagnostic Signals

The detector has several signals (internal temperatures, voltages and currents of lamps) that can be used for diagnosing baseline problems. Refer to the Service Manual for details.

Status Indicators

Two status indicators are located on the front of the detector. The lower left indicates the power supply status, the upper right indicates the detector status.

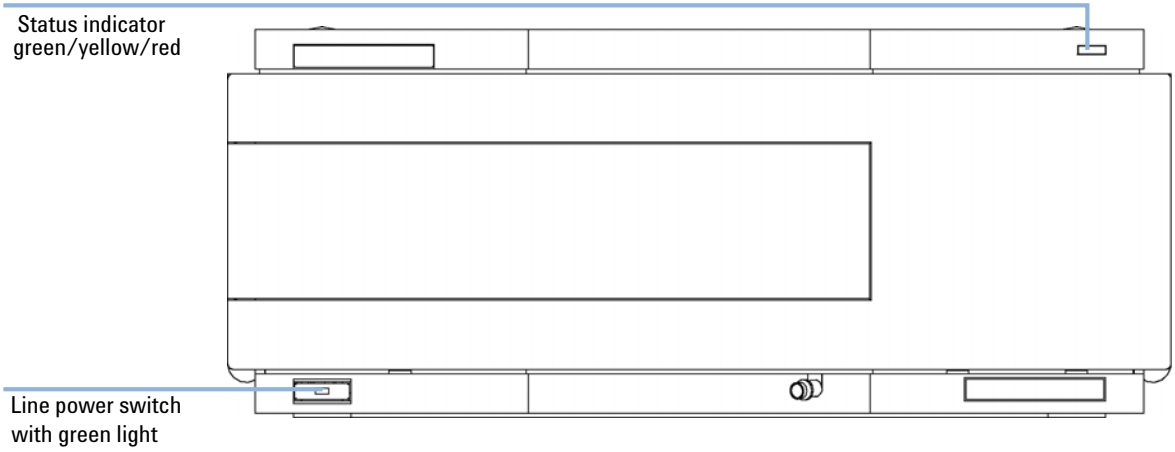


Figure 51 Location of Status Indicators

Power Supply Indicator

The power supply indicator is integrated into the main power switch. When the indicator is illuminated (*green*) the power is ON.

Detector Status Indicator

The detector status indicator indicates one of four possible detector conditions:

- When the status indicator is *OFF* (and power switch light is on), the detector is in a *prerun* condition, and is ready to begin an analysis.
- A *green* status indicator, indicates the detector is performing an analysis (*run* mode).
- A *yellow* indicator indicates a *not-ready* condition. The detector is in a not-ready state when it is waiting for a specific condition to be reached or completed (for example, immediately after changing a set point), or while a self-test procedure is running.
- An *error* condition is indicated when the status indicator is *red*. An error condition indicates the detector has detected an internal problem which affects correct operation of the detector. Usually, an error condition requires attention (e.g. leak, defective internal components). An error condition always interrupts the analysis.
- A *red-blinking* indicator indicates that the module is in resident mode (e.g. during update of main firmware).

Available Tests versus Interfaces

NOTE

Depending on the used interface, the available tests and the screens/reports may vary.

Preferred tool should be the Agilent Diagnostic Software, see "Agilent Diagnostic Software" on page 106.

Screenshots used within these procedures are based on the Agilent ChemStation.

In future, a user interface may not show the Diagnostics/Tests anymore. Then the Agilent Diagnostic Software must be used instead.

The Agilent ChemStation may not include any maintenance/test functions.

Table 19 Available Tests versus Interfaces

Interface Test	Diagnostic Software	Agilent ChemStation	Instant Pilot G4208A
Wavelength Verification/Re-calibration	yes (*)	Tests (*)	Maintenance (*)
Lamp Intensity	yes (*)	Tests (*)	Diagnosis (*)
Holmium Test	yes (*)	Tests (*)	Diagnosis (*)
Cell Test	yes (*)	Tests (*)	n/a
D/A Converter Test	yes (*)	Tests (*)	n/a
Filter / Grating Motor Test	yes	Tests (*)	command line (***)
Test Chromatogram	yes	command line (**)	command line (***)
Spectrum (Blank, Sample, Holmium)	yes	n/a	Control
Service Dialog	for service only	n/a	for service only

(*) interface provides passed/fail information or a plot.

(**) requires a comand via comand line

(***) requires a comand via comand line in Service Mode

Agilent Diagnostic Software

The Agilent Diagnostic Software is a standalone product that can be used with or without data system. Agilent Lab Advisor helps to manage the lab for high quality chromatographic results and can monitor in real time a single Agilent LC or all the Agilent GCs and LCs configured on the lab intranet.

Agilent Lab Advisor provides diagnostic capabilities for all Agilent 1200 Series HPLC modules. This includes tests and calibrations procedures as well as the different injector steps to perform all the maintenance routines.

Agilent Lab Advisor also allows users to monitor the status of their LC instruments. The Early Maintenance Feedback (EMF) feature helps to carry out preventive maintenance. In addition, users can generate a status report for each individual LC instrument. The tests and diagnostic features as provided by the Agilent Lab Advisor Software may differ from the descriptions in this manual. For details refer to the Agilent Lab Advisor help files.

This manual provides lists with the names of Error Messages, Not Ready messages, and other common issues.

8
Error Information

What Are Error Messages 108
General Error Messages 109
Detector Error Messages 114

This chapter describes the meaning of detector error messages, and provides information on probable causes and suggested actions how to recover from error conditions.

What Are Error Messages

Error messages are displayed in the user interface when an electronic, mechanical, or hydraulic (flow path) failure occurs which requires attention before the analysis can be continued (for example, repair, or exchange of consumables is necessary). In the event of such a failure, the red status indicator at the front of the module is switched on, and an entry is written into the instrument logbook.

General Error Messages

General error messages are generic to all Agilent 1200 Series HPLC modules.

Timeout

The timeout threshold was exceeded.

Probable cause	Suggested actions
1 The analysis was completed successfully, and the time0ut function switched off the pump as requested.	Restart the analysis where required.
2 A not-ready condition was present during a sequence or multiple-injection run for a period longer than the timeout threshold.	Check the logbook for the occurrence and source of a not-ready condition.

Shutdown

An external instrument has generated a shut-down signal on the remote line. The detector continually monitors the remote input connectors for status signals. A LOW signal input on pin 4 of the remote connector generates the error message.

Probable cause	Suggested actions
1 Leak detected in an external instrument with a remote connection to the system.	Fix the leak in the external instrument before restarting the pump.
2 Shut-down in an external instrument with a remote connection to the system.	Check external instruments for a shut-down condition.
3 The degasser failed to generate sufficient vacuum for solvent degassing.	Check the degasser module for an error condition. Refer to the *Reference Manual* for the Agilent 1200 Series vacuum degasser.

Remote Timeout

A not-ready condition is still present on the remote input. When an analysis is started, the system expects all not-ready conditions (for example, a not-ready condition during detector balance) to switch to run conditions within one minute of starting the analysis. If a not-ready condition is still present on the remote line after one minute the error message is generated.

Probable cause	Suggested actions
1 Not-ready condition in one of the instruments connected to the remote line.	Ensure the instrument showing the not-ready condition is installed correctly, and is set up correctly for analysis.
2 Defective remote cable.	Exchange the remote cable.
3 Defective components in the instrument showing the not-ready condition.	Check the instrument for defects (refer to the instrument's reference documentation).

Synchronization Lost

During an analysis, the internal synchronization or communication between one or more of the modules in the system has failed. The system processors continually monitor the system configuration. If one or more of the modules is no longer recognized as being connected to the system, the error message is generated.

Probable cause	Suggested actions
1 CAN cable disconnected.	Ensure all the CAN cables are connected correctly.
2 Defective CAN cable.	Ensure all CAN cables are installed correctly.
3 Defective main board in another module.	Switch off the system. Restart the system, and determine which module or modules are not recognized by the system.

Leak

A leak was detected in the detector. The signals from the two temperature sensors (leak sensor and board-mounted temperature-compensation sensor) are used by the leak algorithm to determine whether a leak is present. When a leak occurs, the leak sensor is cooled by the solvent. This changes the resistance of the leak sensor which is sensed by the leak-sensor circuit on the VWM board.

Probable cause	Suggested actions
1 Loose fittings.	Ensure all fittings are tight.
2 Broken capillary.	Exchange defective capillaries.
3 Leaking flow cell.	Exchange flow cell components.

Leak Sensor Open

The leak sensor in the detector has failed (open circuit). The current through the leak sensor is dependent on temperature. A leak is detected when solvent cools the leak sensor, causing the leak-sensor current to change within defined limits. If the current falls outside the lower limit, the error message is generated.

Probable cause	Suggested actions
1 Leak sensor not connected to the VWM board.	Ensure the leak sensor is connected correctly.
2 Defective leak sensor.	Exchange the leak sensor.

Leak Sensor Short

The leak sensor in the detector has failed (short circuit). The current through the leak sensor is dependent on temperature. A leak is detected when solvent cools the leak sensor, causing the leak-sensor current to change within defined limits. If the current increases above the upper limit, the error message is generated.

Probable cause	Suggested actions
1 Defective leak sensor.	Exchange the leak sensor.

Compensation Sensor Open

The ambient-compensation sensor (NTC) on the VWM board in the detector has failed (open circuit). The resistance across the temperature compensation sensor (NTC) on the VWM board is dependent on ambient temperature. The change in resistance is used by the leak circuit to compensate for ambient temperature changes. If the resistance across the sensor increases above the upper limit, the error message is generated.

Probable cause	Suggested actions
1 Defective VWM board.	Exchange the VWM board.

Compensation Sensor Short

The ambient-compensation sensor (NTC) on the VWM board in the detector has failed (short circuit). The resistance across the temperature compensation sensor (NTC) on the VWM board is dependent on ambient temperature. The change in resistance is used by the leak circuit to compensate for ambient temperature changes. If the resistance across the sensor falls below the lower limit, the error message is generated.

Probable cause	Suggested actions
1 Defective VWM board.	Exchange the VWM board.

Fan Failed

The cooling fan in the detector has failed. The hall sensor on the fan shaft is used by the VWM board to monitor the fan speed. If the fan speed falls below two revolutions/second for more than five seconds, the error message is generated.

Probable cause	Suggested actions
1 Fan cable disconnected.	Ensure the fan is connected correctly.
2 Defective fan.	Exchange fan.
3 Defective VWM board.	Exchange the VWM board.

Open Cover

The top foam has been removed. The sensor on the VWM board detects when the top foam is in place. If the foam is removed during operation, the lamp and grating drive power is switched off, and the error message is generated.

Probable cause	Suggested actions
1 Top foam removed.	Replace the foam.

Detector Error Messages

These errors are detector specific.

Lamp Current Missing

The lamp anode current is missing. The processor continually monitors the anode current drawn by the lamp during operation. If the anode current falls below the lower current limit, the error message is generated.

Probable cause	Suggested actions
1 Lamp disconnected.	Ensure the lamp connector is seated firmly.
2 Top foam removed while lamp is on.	Replace the top foam, and turn ON the lamp.
3 Defective lamp or non-Agilent lamp.	Exchange the lamp.
4 Defective VWM board.	Exchange the VWM board.
5 Defective power supply.	Exchange the power supply.

Lamp Voltage Missing

The lamp anode voltage is missing. The processor continually monitors the anode voltage across the lamp during operation. If the anode voltage falls below the lower limit, the error message is generated.

Probable cause	Suggested actions
1 Defective or non-Agilent lamp.	Exchange the lamp.
2 Defective power supply.	Exchange the power supply.
3 Defective VWM board.	Exchange the VWM board.

Lamp Ignition Failed

The lamp failed to ignite. The processor monitors the lamp current during the ignition cycle. If the lamp current does not rise above the lower limit within 2 – 5 seconds, the error message is generated.

Probable cause	Suggested actions
1 Lamp not connected.	Ensure the lamp is connected.
2 Defective or non-Agilent lamp.	Exchange the lamp.
3 Defective power supply.	Exchange the power supply.
4 Defective VWM board.	Exchange the VWM board.

Heater Current Missing

The lamp heater current in the detector is missing. During lamp ignition, the processor monitors the heater current. If the current does not rise above the lower limit within one second, the error message is generated.

Probable cause	Suggested actions
1 Lamp not connected.	Ensure the lamp is connected.
2 Ignition started without the top foam in place.	Replace the top foam, and turn on the lamp.
3 Defective VWM board.	Exchange the VWM board.
4 Defective or non-Agilent lamp.	Exchange the lamp.
5 Defective power supply.	Exchange the power supply.

Calibration Failed

The intensity maximum was not found during wavelength calibration.Calibration 0 Failed: Zero-order calibration failed.Calibration 1 Failed: 656 nm calibration failed. During zero-order and 656 nm calibration, the detector searches for the intensity maximum. If the maximum is not detected within the scan range, the error message is generated.

	Probable cause	Suggested actions
1	Lamp is OFF.	Switch on the lamp.
2	Incorrect flow cell installation.	Ensure the flow cell are installed correctly.
3	Flow cell contamination or air bubbles.	Clean/replace flow cell windows or remove air bubbles.
4	Intensity too low.	Replace lamp.
5	Current step value too far from maximum.	Enter a different calibration step value (different scan range). Repeat the calibration.
6	Misaligned/defective grating assembly.	Run the grating-motor test to determine if the grating assembly is defective. If defective, replace the optical unit.
7	Defective VWM board.	Exchange the VWM board.

Holmium Oxide Test Failed

The holmium oxide test in the detector has failed. During the holmium test, the detector moves the holmium filter into the light path, and compares the measured absorbance maxima of the holmium oxide filter with expected maxima. If the measured maxima are outside the limits, the error message is generated.

Probable cause	Suggested actions
1 Misaligned/defective grating assembly.	• Ensure the flow cell is inserted correctly, and is free from contamination (cell windows, buffers, and so on). • Run the filter-motor test to determine if the grating motor assembly is defective. Exchange the filter motor assembly. • Run the grating-motor test to determine if the grating assembly is defective. If defective, replace the optical unit.

Grating/Filter Motor Test Failed

The motor test has failed.

test

- Test 0 Failed: Filter motor.
- Test 1 Failed: Grating motor.

During the motor tests, the detector moves the motor to the end position while monitoring the end-position sensor. If the end position is not found, the error message is generated.

Probable cause	Suggested actions
1 Defective motor assembly.	Run the grating-motor test to determine if the grating assembly is defective. If defective, replace the optical unit.

Wavelength Check Failed

The automatic wavelength check after lamp ignition has failed. When the lamp is switched on, the detector waits 1 minute to warm-up the lamp. Then a check of the deuterium emission line (656 nm) via the reference diode is performed. If the emission line is more than 3 nm away from 656 nm, the error message is generated.

Probable cause	Suggested actions
1 Calibration incorrect.	Recalibrate the detector.

Filter Check Failed

The automatic filter check after lamp ignition has failed. When the lamp is switched on, the detector moves the cutoff filter into the light path. If the filter is functioning correctly, a decrease in lamp intensity is seen. If the expected intensity decrease is not detected, the error message is generated.

Probable cause	Suggested actions
1 Filter motor defective.	Run the filter motor test to determine if the motor is defective.
2 Defective or missing filter.	Exchange the filter assembly.

Filter Missing

The filter motor is not detected.

Probable cause	Suggested actions
1 Filter motor is not connected.	Re-connect the filter motor on the main board.
2 Cable/connector defective.	Replace the optical unit or main board.

Grating Missing

The grating motor is not detected.

Probable cause	Suggested actions
1 Grating motor is not connected.	Re-connect the filter motor on the main board.
2 Cable/connector defective.	Replace the optical unit or main board.

ADC Hardware Error

A/D-Converter hardware is defective.

Probable cause	Suggested actions
1 A/D-Converter hardware is defective.	Replace the optical unit.

Illegal Value From Temperature Sensor

This temperature sensor delivered a value outside the allowed range. The parameter of this event equals the measured temperature in 1/100 centigrade. As a result the temperature control is switched off.

Probable cause	Suggested actions
1 The sensor is defect.	• Ensure the connector to the detector main board is seated firmly. • Replace the temperature sensor. • Replace the main board.
2 Detector is exposed to illegal ambient conditions.	Verify that the ambient conditions are within the allowed range.

Illegal Value From Air Inlet Temperature Sensor

This temperature sensor (located on the detector main board) delivered a value outside the allowed range. The parameter of this event equals the measured temperature in 1/100 centigrade. As a result the temperature control is switched off.

Probable cause	Suggested actions
1 The temperature sensor is defect.	• Replace the temperature sensor. • Replace the main board.
2 Detector is exposed to illegal ambient conditions.	Verify that the ambient conditions are within the allowed range.

Heater Failed

Every time the deuterium lamp or the tungsten lamp is switched on or off a heater self-test is performed. If the test fails an error event is created. As a result the temperature control is switched off.

Probable cause	Suggested actions
1 Defective connector or cable.	Ensure the connector to the detector main board is seated firmly.
2 Defective heater.	Exchange heater assembly.

Heater Power At Limit

The available power of the heater reached either the upper or lower limit. This event is sent only once per run. The parameter determines which limit has been hit:

0 means upper power limit hit (excessive ambient temperature drop).

1 means lower power limit hit (excessive ambient temperature increase).

Probable cause	Suggested actions
1 Ambient conditions have changed too much during the run, so that optimum results may not be guaranteed.	• Verify that the reproducibility of your results is not affected. • Expose the detector to more stable ambient conditions.

No Run Data Available In Device

In a very rare case the capacity of the CompactFlash Card is not sufficient. This could happen for example when the interrupt of LAN communication takes longer and the detector uses special settings (e.g full data rate at 80 Hz plus full spectra plus all signals) during data buffering.

Probable cause	Suggested actions
1 CompactFlash Card is full.	• Correct communication problem. • Reduce data rate.

9
Test Functions for User

Intensity Test 124
Checking the Photocurrent 126
Wavelength Verification/Calibration 128
Holmium Oxide Test 130

This chapter describes the detector's built in test functions.

Intensity Test

The intensity test measures the intensity of the deuterium lamp over the full VWD wavelength range (190 – 600 nm). The test can be used to determine the performance of the lamp, and to check for dirty or contaminated flow cell windows. When the test is started, the gain is set to zero. To eliminate effects due to absorbing solvents, the test should be done with water in the flow cell. The shape of the intensity spectrum is primarily dependent on the lamp, grating, and diode characteristics. Therefore, intensity spectra will differ slightly between instruments. The figure below shows a typical intensity test spectrum.

The Intensity Test is available in

- Agilent Diagnostic Software (preferred tool).
- Agilent Instant Pilot G4208A, via More-Diagnosis-VWD-Lamp Intensity Test.

Intensity Test Evaluation

The Agilent Diagnostic Software and the Instant Pilot evaluate three values automatically and display the limits for each value, the average, the minimum and the maximum of all data points and *passed* or *failed* for each value.

Instensity Test with Instant Pilot

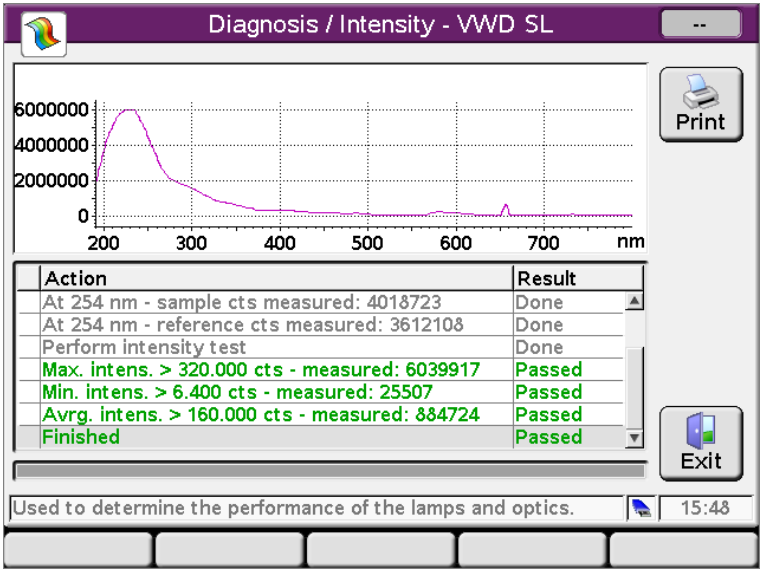


Figure 52 Instensity Test with Instant Pilot

Intensity Test Failed

Probable cause	Suggested actions
1 Empty flow cell	Ensure the flow cell is filled with water.
2 Flow cell windows dirty	Repeat the test with the flow cell removed. If the test passes, exchange the flow cell windows.
3 Optics defect	Clean/replace optical components.
4 Lamp defectiv	Exchange the lamp.

Checking the Photocurrent

To identify problems with the flow cell (contaminated windows, air bubbles and so on) you can use raw data from the sample and reference photodiode (unfiltered and not logarithmic).

The photocurrent information (RAW SAMPLE/REFERENCE) is available in

- Agilent Diagnostic Software (preferred tool).
- Agilent Instant Pilot G4208A, via More-Diagnosis-VWD-Lamp Intensity Test.

Photocurrent Evaluation

With a clean cell the counts for sample and reference are in the same range. If the sample side shows much lower values than the reference side the flow cell might have a problem due to

✔ dirty windows,

✔ absorbing solvents/compounds,

✔ not correctly mounted flow cell, or

✔ air bubbles

Checking the Photocurrent with the Instant Pilot

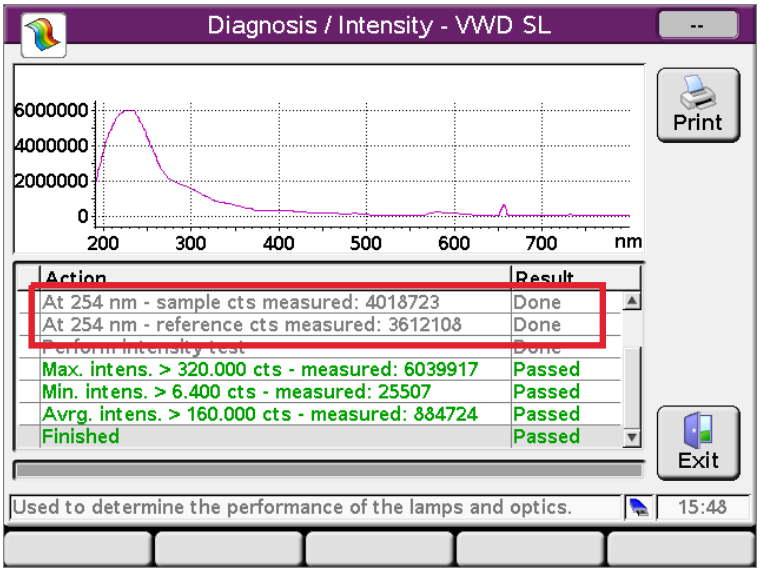


Figure 53 Checking the Photocurrent with the Instant Pilot

Wavelength Verification/Calibration

Wavelength calibration of the detector is done using the zero-order position and 656 nm emission line position of the deuterium lamp. The calibration procedure involves two steps. First the grating is calibrated on the zero-order position. The stepper-motor step position where the zero-order maximum is detected is stored in the detector. Next, the grating is calibrated against the deuterium emission-line at 656 nm, and the motor position at which the maximum occurs is stored in the detector.

In addition to the zero-order and 656 nm (alpha-emission line) calibration, the beta-emission line at 486 nm and the three holmium lines are used for the complete wavelength calibration process. These holmium lines are at 360.8 nm, 418.5 nm and 536.4 nm.

NOTE The wavelength verification/calibration takes about 2.5 minutes and is disabled within the first 10 minutes after ignition of the lamp because initial drift may distort the measurement.

When the lamp is turned ON, the 656 nm emission line position of the deuterium lamp is checked automatically.

The Wavelength Verification/Calibration is available in

- Agilent Diagnostic Software (preferred tool).
- Agilent Instant Pilot G4208A, via More-Diagnosis-VWD-Calibration.

When to Calibrate the Detector

The detector is calibrated at the factory, and under normal operating conditions should not require recalibration. However, it is advisable to recalibrate:

- after maintenance (flow cell or lamp),
- after repair of components in the optical unit,
- after exchange of the optical unit or VWM board,
- at a regular interval, at least once per year (for example, prior to an Operational Qualification/Performance Verification procedure), and
- when chromatographic results indicate the detector may require recalibration.

Wavelength Verification/Calibration with Instant Pilot

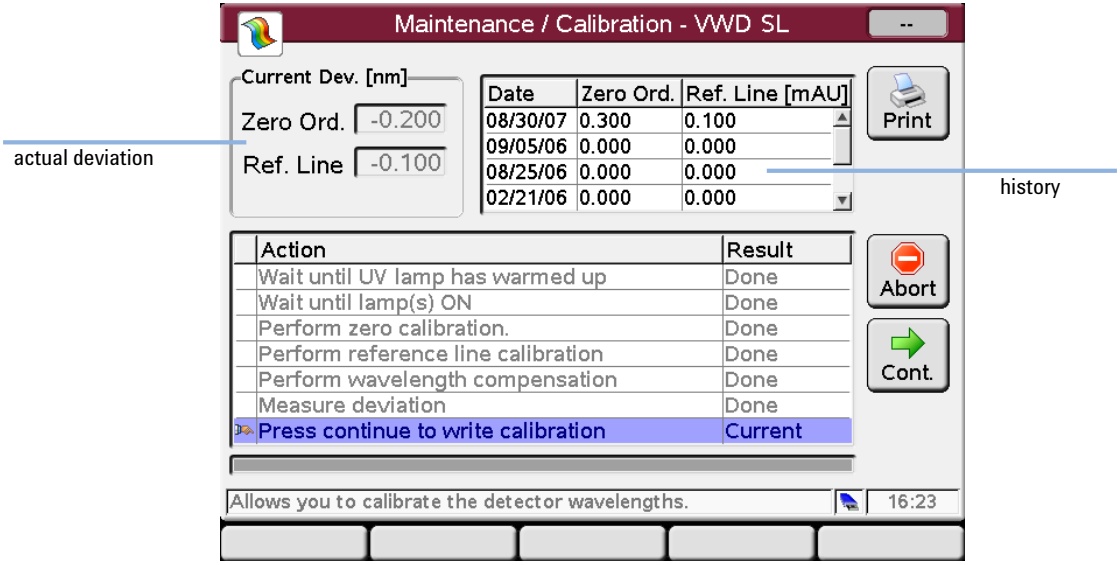


Figure 54 Wavelength Verification/Calibration with Instant Pilot

Holmium Oxide Test

This test verifies the calibration of the detector against the three wavelength maxima of the built-in holmium oxide filter. The test displays the difference between the expected and measured maxima. The figure below shows a holmium test spectrum.

The Holmium Oxide Test is available in

- Agilent Diagnostic Software (preferred tool).
- Agilent Instant Pilot G4208A, via More-Diagnosis-VWD-Holmium Spectrum Test.

The test uses the following holmium maxima:

- 360.8 nm
- 418.5 nm
- 536.4 nm

NOTE See also "Holmium Declaration (UV-Detectors)" "Declaration of Conformity for HOX2 Filter" on page 308.

When to do the Test

- after recalibration,
- as part of the Operational Qualification/Performance Verification procedure, or
- after flow cell maintenance or repair.

Interpreting the Results

The test is passed successfully when all three wavelengths are within ± 1 nm of the expected value. This indicates the detector is calibrated correctly.

Holmium Oxide Test with Instant Pilot

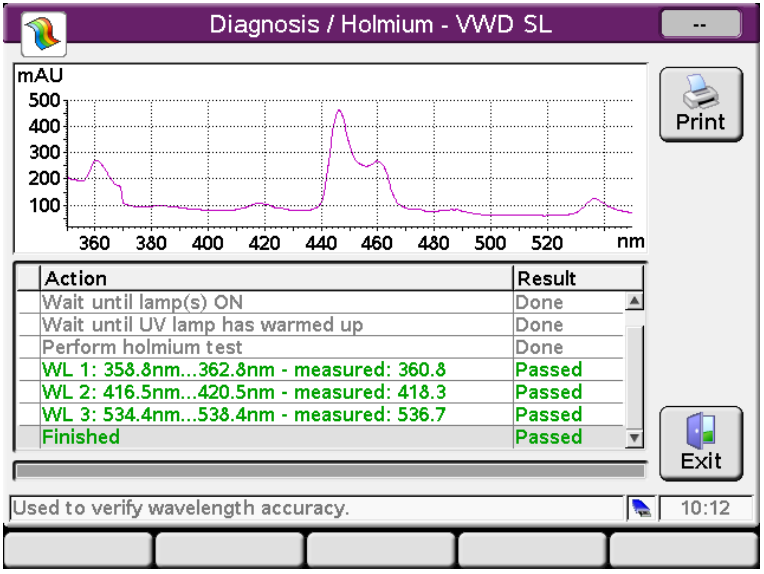


Figure 55 Holmium Oxide Test with Instant Pilot

10
Test Functions for Service

DAC Test 134
Grating Motor Test 136
Filter Motor Test 138
Test Chromatogram 140
Diagnostic Signals 142

This chapter describes the detector's built in test functions for service.

DAC Test

This test determines correct operation of the digital-analog converter (DAC).

The test applies an AC voltage (10 µV) to the DC output of the DAC. The DAC output is connected to the analog output connector at the rear of the detector.

The Dark Current Test is available in

- Agilent Diagnostic Software (preferred tool).
- Agilent Instant Pilot G4208A, via Service Mode - command.
- Agilent ChemStation, via command.

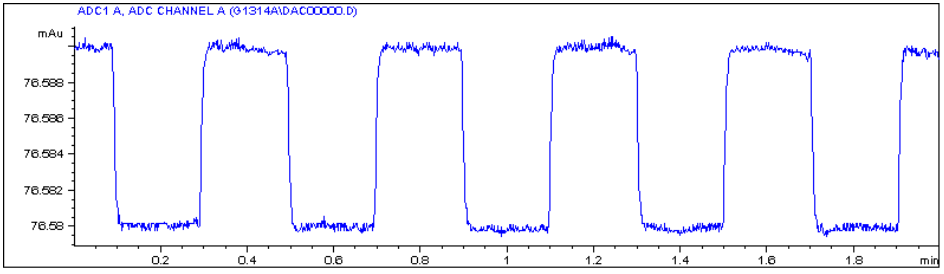


Figure 56 DAC Test

When to do the Test

- if the detector signal is noisy or missing.

Interpreting the Results

The noise on the step should be less than 3 µV.

DAC Test with Instant Pilot

The test can be started via the command line.

- To start the test
  TEST:DAC 1

- Reply: RA 00000 TEST:DAC 1
- To stop the test
  TEST:DAC 0

- Reply: RA 00000 TEST:DAC 0

DAC Test with Agilent ChemStation

The test can be turned on/off via the command line.

- To start the test
  PRINT SENDMODULE$(NVWD, "TEST:DAC 1")

- Reply: RA 00000 TEST:DAC 1
- To stop the test
  PRINT SENDMODULE$(NVWD, "TEST:DAC 0")

- Reply: RA 00000 TEST:DAC 0

DAC Test Fails

	Probable cause	Suggested actions
1	Defective VWM board.	Exchange the VWM board.

Grating Motor Test

This test moves the grating motor to the end position, and displays the motor-position step difference. This checks the movement of the grating drive mechanism.

The Grating Motor Test is available in

- Agilent Diagnostic Software (preferred tool).
- Agilent Instant Pilot G4208A, via Service Mode - command.
- Agilent ChemStation, via command.

When to do the Test

- if recalibration cannot be done successfully, or
- if the holmium test fails.

Interpreting the Results

There result is either succeeded or failed.

Grating Motor Test with Instant Pilot

The test can be started via the command line.

- To start the test
  `TEST:GRAT`

- Reply: RA 00000 TEST:GRAT
- Test succeeded (when passed)

Grating Motor Test with Agilent ChemStation

The test can be started via the command line.

- To start the test
  PRINT SENDMODULE$(NVWD, "TEST:GRAT")

- Reply: RA 00000 TEST:GRAT
- During test, the instrument shows Prerun-Selftest.
- After test, the instrument shows Ready or Error.

Grating Motor Test Failed

Probable cause	Suggested actions
1 Probable Cause?	Exchange Optical Unit.
2 Defective main board.	Exchange the VWM board.

Filter Motor Test

This control function is used to check the motion of second-order cut-off filter. The cut-off filter returns to original position at the end of this control function.

The Filter Motor Test is available in

- Agilent Diagnostic Software (preferred tool).
- Agilent Instant Pilot G4208A, via Service Mode - command.
- Agilent ChemStation, via command.

When to do the Test

- if the holmium test fails.

Interpreting the Results

There result is either succeeded or failed.

Filter Motor Test with Instant Pilot

The test can be started via the command line.

- To start the test
  `TEST:FILT`

- Reply: RA 00000 TEST:FILT
- Test succeeded (when passed)

Filter Motor Test with Agilent ChemStation

The test can be started via the command line.

- To start the test
  PRINT SENDMODULE$(NVWD, "TEST:FILT")

- Reply: RA 00000 TEST:FILT
- During test, the instrument shows Prerun-Selftest.
- After test, the instrument shows Ready or Error.

Filter Motor Test Failed

Probable cause	Suggested actions
1 ProbableCause?	Exchange the filter motor or optical unit.
2 ProbableCause?	Exchange the filter position sensor or optical unit.
3 Defective main board.	Exchange the VWM board.

Test Chromatogram

A pre-defined test chromatogram on the VWM board is processed through ADC like normal signals from the diodes and can be used to check the ADC and the data handling system. The signal is available at the analog output and on the GPIB.

The Test Chromatogram is available in

- Agilent Diagnostic Software (preferred tool).
- Agilent Instant Pilot G4208A, via Service Mode - command.
- Agilent ChemStation, via command.

NOTE The run time of the chromatogram is depending on the setting for response time (peak width). If no stop time is set the chromatogram will repeat continuously.

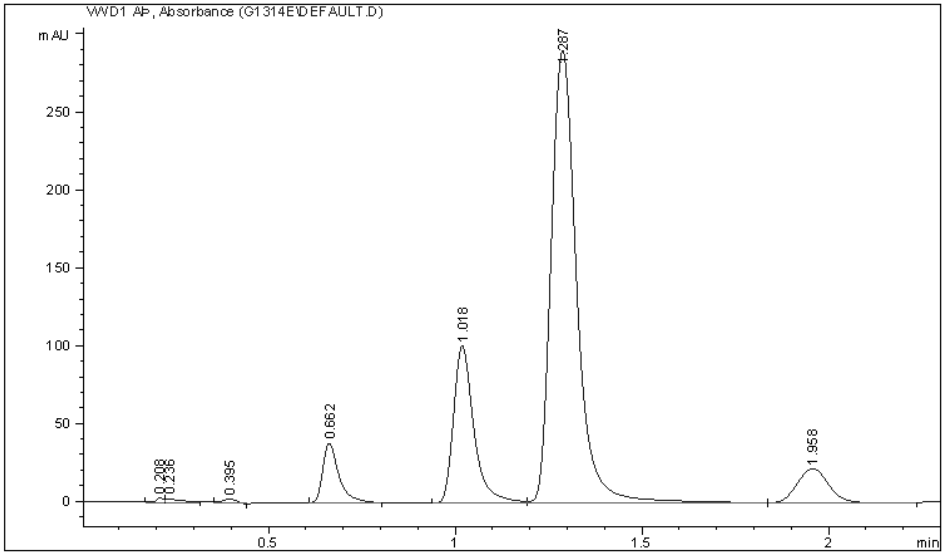


Figure 57 Test Chromatogram (response time 2 seconds)

When to do the Test

In case the signal path should be checked to Control Software or data systems.

Interpreting the Results

If the Control Software and/or the data system shows the chromatogram, the signal path is working.

Test Chromatogram with Instant Pilot

The test can be started via the command line.

- To start the test
  SIMU:DFLT

- Reply: RA 00000 SIMU:DFLT
- Press **Setup** and select the VWD signal.
- Change the Y-range to - 10 to 300 mAU, fit the Time Range to match.
- Return to the PLOT window.
- Press **Start** to start the run. On completion of the run, or when the run is stopped, the test chromatogram is deactivated.

Test Chromatogram with Agilent ChemStation

The test can be started via the command line.

- To start the test
  PRINT SENDMODULE$(NVWD, "SIMU:DFLT")

- Reply: RA 00000 SIMU:DFLT
- Start the run. On completion of the run, or when the run is stopped, the test chromatogram is deactivate.

Diagnostic Signals

Overview of Diagnostic Signals

The detector has several signals (internal temperatures, voltages and currents of lamps) that can be used for diagnosing problems. These can be

- baseline problems deriving from deuterium lamps
- wander / drift problems due to temperature changes

These signals can be used in addition to the normal baseline signal to determine whether correlation to temperature or voltage/current of the lamp.

NOTE

At introduction of the G1314D VWD and G1314E VWD SL Plus, the diagnostic signals are available via the Agilent ChemStation B.03.02 SR1 using commands via the ChemStation command line.

The Agilent Diagnostic Software (A.02.01 Service Release for G1314D/E), the Lab Advisor Software B.01.01 and the Instant Pilot G4208A do not provide this monitoring function.

Baseline Problems Deriving From Deuterium Lamps

Problem Description

With the low noise of the 1200 Series Detector, some deuterium lamps may cause periodic baseline instabilities at the end of lamp life.

NOTE

This may only be observed when operating at very sensitive detection levels.

Lamp instabilities come in many different forms. The period may vary from a few seconds to hours.

Problem Verification

If an 1200 Series VWD shows baseline problems, the following steps to diagnose whether the lamp is the cause of the baseline instability:

1 Ensure that the detector has been properly warmed up, see "Overview of Diagnostic Signals" on page 142.

2 Flush the flow cell with water and start runs without sample injections.

3 To remove any influence of the flow system, remove the cell windows.

NOTE Do not run flow through the cell when cell parts are removed.

If the baseline continues to show the problem, the lamp should be replaced.

NOTE If the baseline is stable after removing the cell windows, look for other possible causes of the problem, for example dirty flow cell, column, sampler, pump, etc.

Solution

Replace the lamp after problem verification.

Part Number	Description	usable in
G1314-60101	long-life deuterium lamp with RFID tag	G1314D/E VWD (preferred)
G1314-60100	long-life deuterium lamp without RFID tag	G1314D/E VWD
2140-0820	long-life deuterium lamp with RFID tag (black cover)	G1315A/B/C/D, G1365A/B/C/D, G1314A/B/C (see note below) RFID tag info used in G1315C/D and G1365C/D only.
2140-0813	long-life deuterium lamp	G1315A/B/C/D, G1365A/B/C/D, G1314A/B/C (see note below)
5181-1530	long-life deuterium lamp (black cover)	G1315A/B/C/D, G1365A/B/C/D, G1314A/B/C (see note below)
2140-0590	standard deuterium lamp	G1315A/B/C/D, G1365A/B/C/D, G1314A/B/C (see note below)

NOTE These lamps can be operated in the Agilent 1200 series variable wavelength detector (G1314A/B/C/D/E) as well. For details about changing the configuration and information on the specifications, refer to the "Exchanging a Lamp" on page 165.

Optimization Information

To extend the useful life of deuterium lamps in the 1200 Series VWD, we recommend

- to turn lamps off over night, or when not used for > 4 hours.

Wander / Drift Problems Due to Temperature Changes

The most frequent cause of ambient temperature fluctuations are unstable laboratory air conditioning systems. Other causes include direct sunshine or drafts from open doors and windows. These temperature changes cause baseline wander which can make reproducible integration of trace level peaks difficult or impossible.

Warm-up of Detector

Give the optical unit enough time to warm-up and stabilize (> 60 minutes). The detector is temperature controlled. After turn-on of the detector, it goes through a cycle of different states:

- 0 to 0.5 minutes the heater control is OFF and the heater element runs at 0% duty cycle.
- 0.5 to 1 minutes the heater control is OFF and the heater element runs at 66% duty cycle. This first minute is used as self-test of the heater functionality.
- 1 to 30 minutes the heater control is OFF and the heater element runs at 40% duty cycle.
- after 30 minutes the heater control is ON and is working with optimized parameters to get the optical unit into the optimal temperature window stabilized.

NOTE The times to stabilize the baseline may vary from instrument to instrument and depends on the environment. The example below was done under stable environmental conditions.

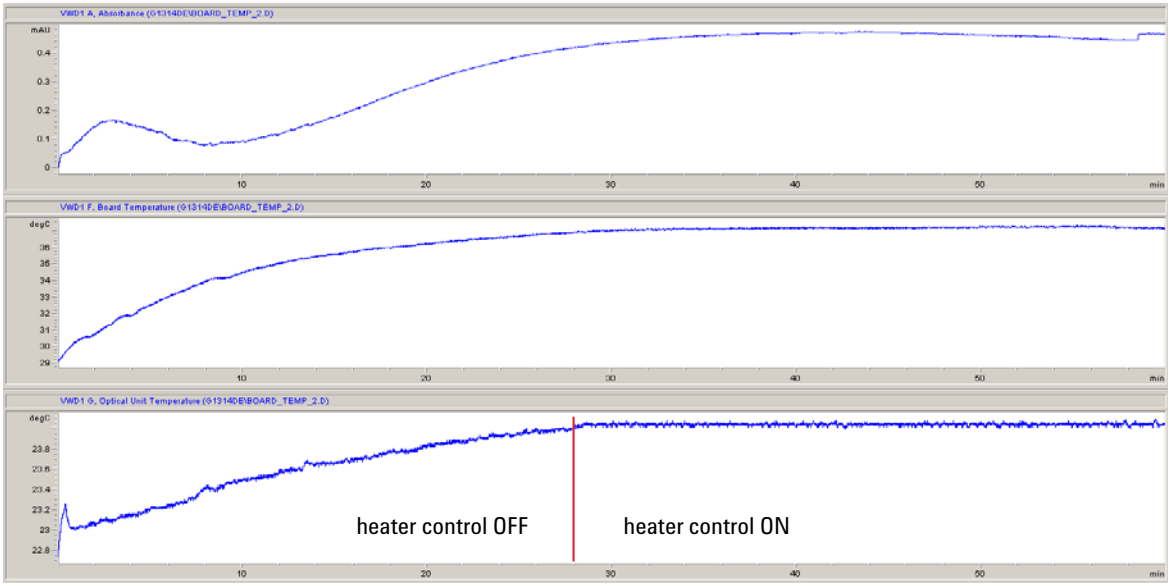


Figure 58 Example of warm-up cycle and corresponding diagnostic signals

Setup of Detector

1. Remove the flow cell to eliminate problems from the flow system.
2. Use the following detector default settings (Default_LC method).
3. Set up a blank run with a run time of at least one hour.
4. Type one of the commands described in Table 21 on page 146into the ChemStation command line or create a ChemStation macro.
5. Start the run.

NOTE Do not run shorter runs than 60 minutes. Typical effects from air condition systems run at cycles of 15 to 20 minutes.

Diagnostic Signal Parameters

Below the details of the available diagnostic signals is described.

Table 20 Signal Parameters

Signal #	Description
5	main board temperature
6	optical unit temperature
7	UV lamp anode voltage

You may use just a single signal or a combination of 2 or 3, separated by comma.

Table 21 Diagnostic Signals - Chemstation Commands

Command	Description
print sendmodule$ (nvwd,"RAWD:SIGSTOR:ADD 5,6,7")	to store the diagnostic signals together with the normal signal
print sendmodule$ (nvwd,"RAWD:SIGSTOR:REM 5,6,7")	to de-activate the storage (if no longer used)
print sendmodule$ (nvwd,"RAWD:CSIGMON:ADD 5,6,7")	to activate the diagnostic signals in the Online Plot window
print sendmodule$ (nvwd,"RAWD:CSIGMON:REM 5,6,7")	to de-activate the diagnostic signals in the Online Plot window (if no longer used)

NOTE If the diagnostic signals are not de-activated by command, they will be active until the detector is power-cycled.

Evaluate the Data

1 When the run has completed, open the ChemStation Data Analysis.

2 Load the data file.

3 Look for a correlation between the temperature (or lamp voltage) signal and the baseline.

4 Determine the rate of temperature change.

5 Look for trends which prevail for 5 minutes or longer. Turbulences around one minute or less can be ignored.

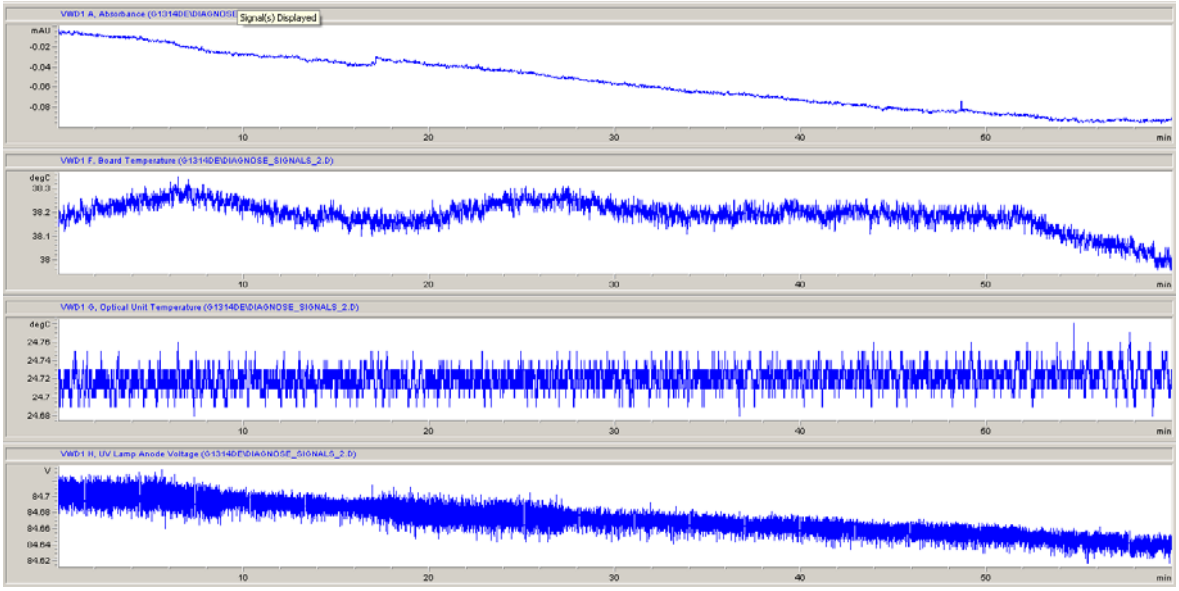


Figure 59 Diagnostic signals added to normal signal

Additional Signals

The detector provides additional standard signals that can be used for troubleshooting. These are

- Signal without Reference
- Reference only

These can be set via the Agilent ChemStation.

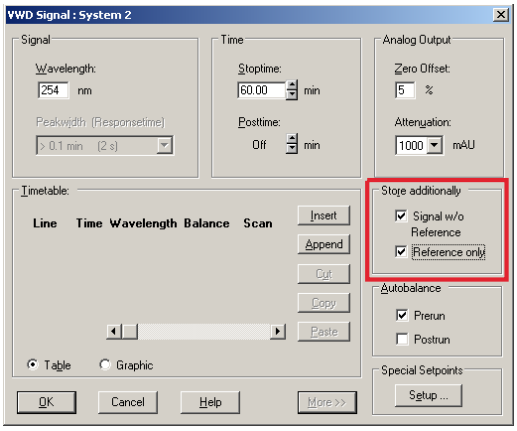


Figure 60 Additional Signals on ChemStation (Settings)

The figure below shows an example with a stable environment. The signals Sample and Reference are shown in addition to the standard signal.

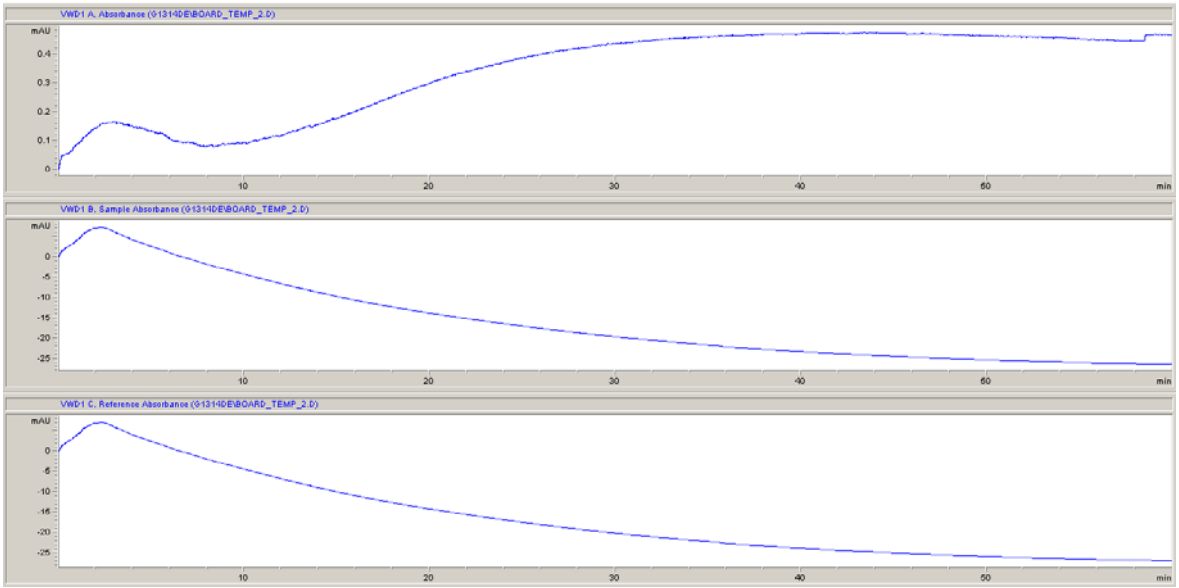


Figure 61 Standard (top), Sample (mid) and Reference (bottom) during warm-up

Adding an External Temperature Sensor for Diagnostic Purpose

There are detectors shipped out with different main boards:

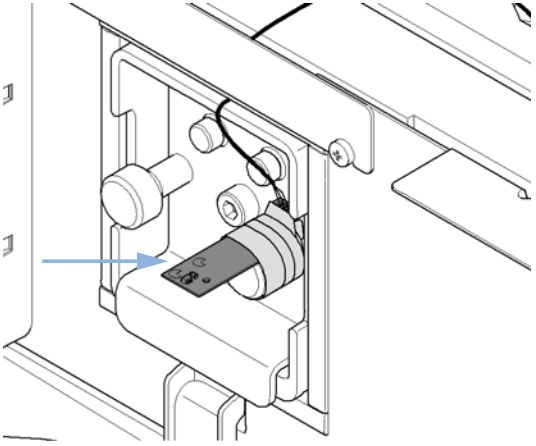
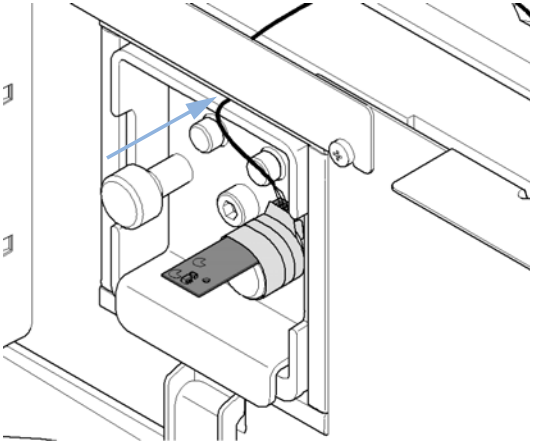
1 Main Board with 4 connectors, TEMP SENS 2 used for Temperature Sensor

2 Main Board with 1 connector, TEMP SENS 2 used for Temperature Sensor

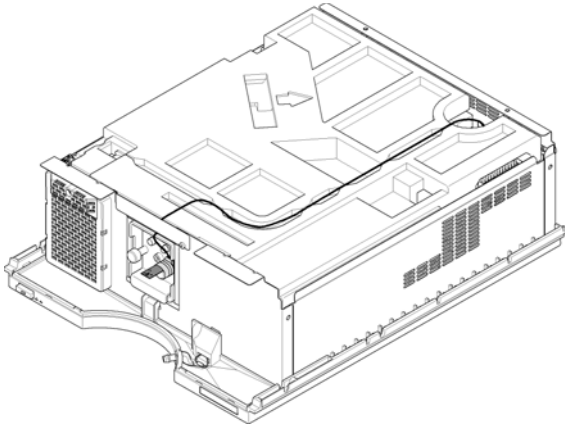
3 Main Board with 2 connectors, TEMP SENS 2 used for Temperature Sensor

The boards with 2 and more connectors allow the addition of an external temperature sensor (**part number: G1314-65801** sensor with cable).

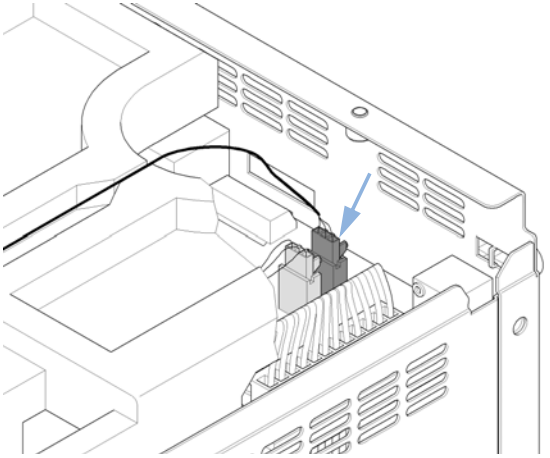
Installation of external Temperature Sensor

1 Prepare the Temperature Sensor by surrounding the sensor with ESD tape and fix it to the thumb screw of the flow cell 	**2** Route the cable between the flow cell and the plate. 

3 Route the Temperature Sensor cable within the foam channel towards the rear of the foam.



4 Connect the cable to the TEMP SENS 1 connector (closer to the rear).



Next Steps:

5 Close the instrument.

6 Install the VWD into the stack.

Setup of the Agilent ChemStation

To evaluate the external temperature signal, an Agilent ChemStation A.03.02 SR or later is required. A macro tempmon.mac is required to activate additional diagnostic signals (inclusive external temp sensor, heater duty cycle, board temperature, optical temperature).

```
! MACRO TempMon.mac
! Version 1.0
! created by Wolfgang Albrecht, Agilent Technologies, Germany
! last modification 09/11/2008
!
! This macro can be used to open/add additional signals to the Agilent ChemStation
! for measurements in unstable environment (problems with drift, wander, noise).
! From the ChemStatiion command line type
! macro tempmon.mac,go

Name TempMon
!
listmessages on,400,400 ! Popup window to list all messages during execution


print sendmodule$ (nvwd,"RAWD:SIGSTOR:ADD 0") ! A: Sig A
print sendmodule$ (nvwd,"RAWD:SIGSTOR:ADD 1") ! B: Sig B
print sendmodule$ (nvwd,"RAWD:SIGSTOR:ADD 2") ! C: Sig C
print sendmodule$ (nvwd,"RAWD:SIGSTOR:ADD 3") ! D: Sample intensity
print sendmodule$ (nvwd,"RAWD:SIGSTOR:ADD 4") ! E: Reference intensity
print sendmodule$ (nvwd,"RAWD:SIGSTOR:ADD 5") ! F: Board Temperature
print sendmodule$ (nvwd,"RAWD:SIGSTOR:ADD 6") ! G: Optical unit Temp Sensor for TCTL
print sendmodule$ (nvwd,"RAWD:SIGSTOR:ADD 7") ! H: UV Lamp voltage
print sendmodule$ (nvwd,"RAWD:SIGSTOR:ADD 14") ! O: AUX Sig 0
print sendmodule$ (nvwd,"RAWD:SIGSTOR:ADD 15") ! P: AUX Sig 1
print sendmodule$ (nvwd,"RAWD:SIGSTOR:ADD 16") ! Q: AUX Sig 2
print sendmodule$ (nvwd,"RAWD:CSIGMON:ADD 3") ! D: Sample intensity
print sendmodule$ (nvwd,"RAWD:CSIGMON:ADD 4") ! E: Reference intensity
print sendmodule$ (nvwd,"RAWD:CSIGMON:ADD 5") ! F: Board Temperature
print sendmodule$ (nvwd,"RAWD:CSIGMON:ADD 6") ! G: Optical unit Temp Sensor for TCTL
print sendmodule$ (nvwd,"RAWD:CSIGMON:ADD 7") ! H: UV Lamp voltage
print sendmodule$ (nvwd,"RAWD:CSIGMON:ADD 14") ! O: AUX Sig 0
print sendmodule$ (nvwd,"RAWD:CSIGMON:ADD 15") ! P: AUX Sig 1
print sendmodule$ (nvwd,"RAWD:CSIGMON:ADD 16") ! Q: AUX Sig 2
print sendmodule$ (nvwd,"~sigs 0, 13") ! O: AUX 0 - DutyCycle mAU = %
print sendmodule$ (nvwd,"~sigs 1, 1") ! P: AUX 1 - Temp Sensor 1
print sendmodule$ (nvwd,"~sigs 2, 2") ! Q: AUX 2 - Temp Sensor 2
!
! ChemStation Settings for Online Signals
! O: AUX 1 - Heater Duty Cycle [1000 cnts = 1% duty cycle] -> 100000
! P: AUX 2 - TEMP SENSOR 1 - EXTERNAL [1000 cnts = 1 deg C] -> 10000
! Q: AUX 3 - TEMP SENSOR 2 - INTERNAL [1000 cnts = 1 deg C] -> 10000
!
print "Settings loaded ...."

!

EndMacro
```

The macro should be started from the CS command line:
macro tempmon.mac,go

The macro will be active as long as the CS is active. The macro opens the additional signals in the Online-Plot window of the CS and stores them as additional signals in the data file.

Set up blank runs with 1-2 hours duration. This will assure that long term effects become visible. If intermittent effects are diagnosed, then you might use the macro in combination with the normal application method.

Evaluation of the Diagnostic Signals

The plot below shows an example in a stable environment.

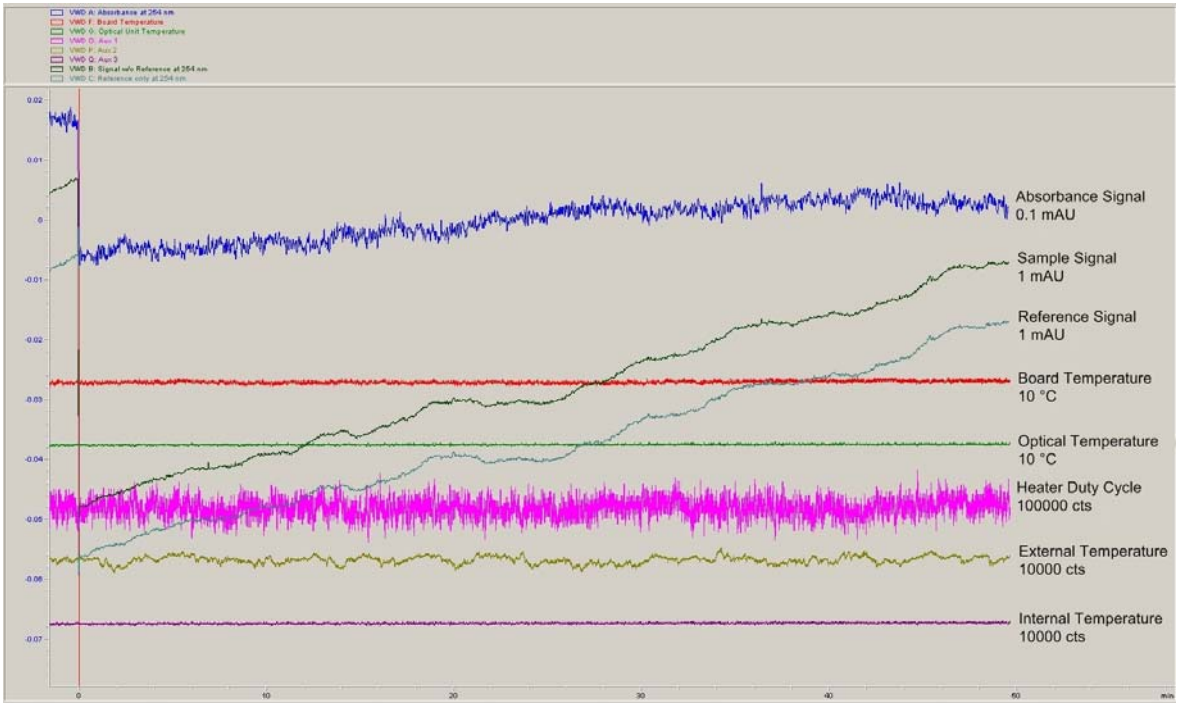


Figure 62 Example plot from ChemStation

NOTE The scaling of the Sample and reference Signal is different compared to the Absorbance Signal.

Depending on the initial duty cycle level the detector is running stable (typically at 40%) at the environmental conditions 30 minutes after lamp on (when the temperature regulation starts to work), the regulation is about +/- 2.5 K.

If the temperature change is more than 2.5 K, the heater duty cycle will run against the lower or upper limit and the baseline starts to drift continuously until the environment comes back into the regulation range.

The next example shows an extreme situation in a lab. The detector runs stable; the heater duty cycle (AUX 1) runs around 40%. Then the temperature in the lab changes from 26°C to more than 32°C. The heater tries to reduce the heater power but runs at 30 minutes against its lower limit (5%). The result is that the temperature in the detector (optical and main board) increases all the time and therefore the baseline is continuously drifting.

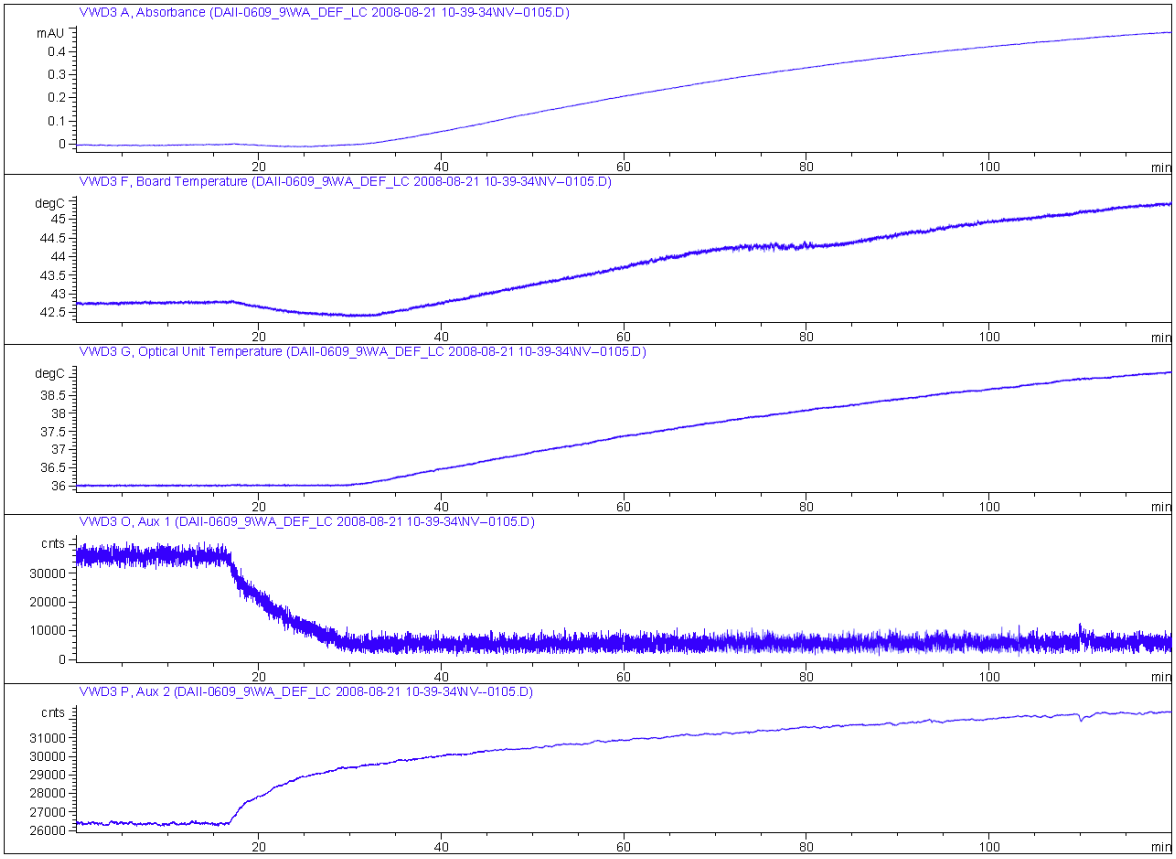


Figure 63 Example plot from ChemStation

The same would happen in the opposite direction if the temperature drops that far that the heater duty cycle runs against the upper limit (95%) at around 90 minutes. The result is that the temperature in the detector (optical and main board) becomes unstable and the baseline starts to drift.

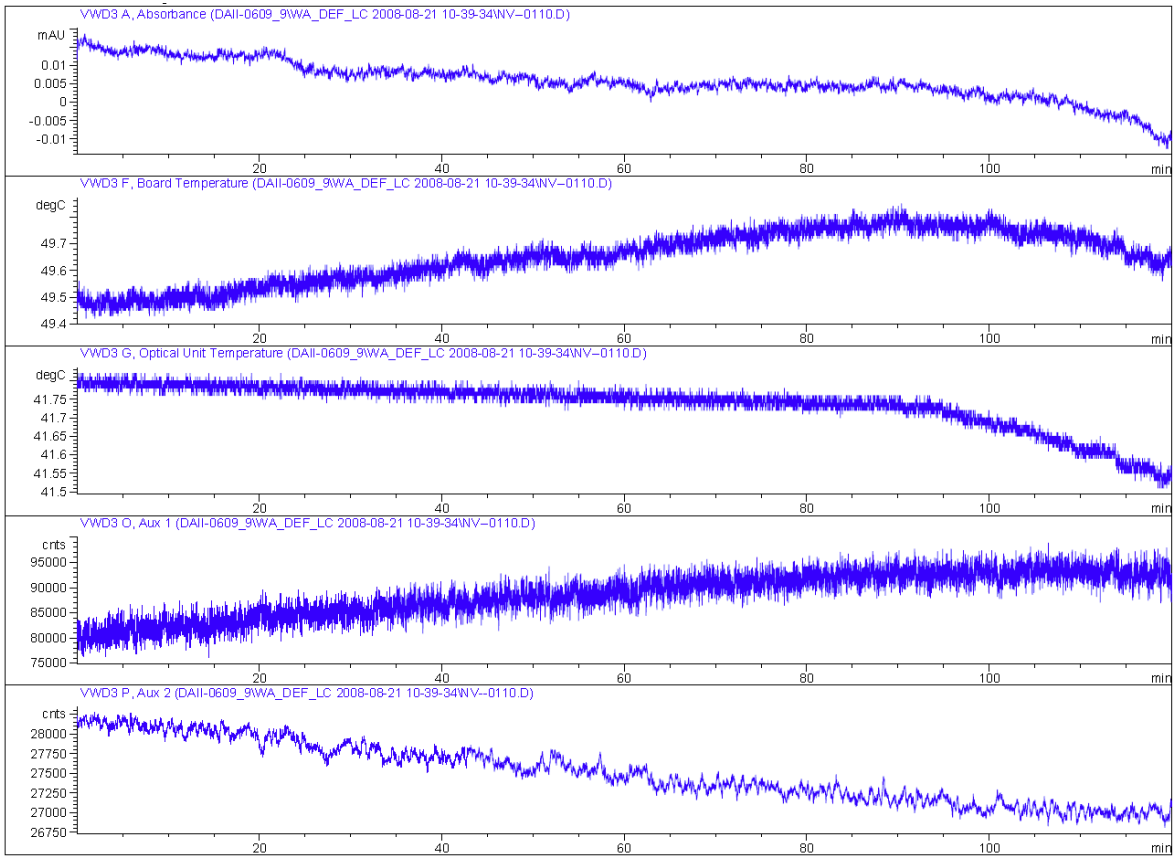


Figure 64 Example plot from ChemStation

11
Maintenance and Repair

Introduction to Maintenance and Repair 158
Warnings and Cautions 159
Cleaning the Detector 161
Using the ESD Strap 162

This chapter provides general information on maintenance and repair of the detector.

Introduction to Maintenance and Repair

Simple Repairs - Maintenance

The detector is designed for easy repair. The most frequent repairs such as lamp change and flow cell change can be done from the front of the detector with the detector in place in the system stack. These repairs are described in chapter *Maintenance* (part of the *User Manual* and *Service Manual*).

Exchanging Internal Parts - Repair

Repairs require the exchange of defective internal parts. Removing the module from the stack, opening up the covers and disassembling the module is required. Special knowledge and training are needed to carry out these procedures. Therefore, these repairs should only be performed by trained Agilent service providers.

Warnings and Cautions

WARNING

Instrument is partially energized when switched off, as long as the power cord is plugged in.

Risk of stroke and other personal injury. Repair work at the detector can lead to personal injuries, e. g. shock hazard, when the detector cover is opened and the instrument is connected to power.

➔ Never perform any adjustment, maintenance or repair of the instrument with the top cover removed and with the power cord plugged in.

➔ The security lever at the power input socket prevents that the detector cover is taken off when line power is still connected. Never plug the power line back in when cover is removed.

WARNING

Sharp metal edges

Sharp-edged parts of the equipment may cause injuries.

➔ To prevent personal injury, be careful when getting in contact with sharp metal areas.

WARNING

Toxic and hazardous solvents

The handling of solvents and reagents can hold health risks.

➔ When working with solvents observe appropriate safety procedures (for example, goggles, safety gloves and protective clothing) as described in the material handling and safety data sheet supplied by the solvent vendor, especially when toxic or hazardous solvents are used.

CAUTION

Electronic boards and components are sensitive to electrostatic discharge (ESD).

ESD can damage electronic boards and components.

➔ In order to prevent damage always use an ESD protection when handling electronic boards and components.

CAUTION

Electronic boards and components are sensitive to electrostatic discharge (ESD).

➔ To prevent accidental electrostatic discharge when coming into contact with components inside the instrument, touch one of the metal housing panels at the front of the instrument.

Cleaning the Detector

The module case should be kept clean. Cleaning should be done with a soft cloth slightly dampened with water or a solution of water and mild detergent. Do not use an excessively damp cloth allowing liquid to drip into the detector.

WARNING

Liquid dripping into the electronic compartment of your module.

Liquid in the module electronics can cause shock hazard and damage the module.

➔ Do not use an exessively damp cloth during cleaning.

➔ Drain all solvent lines before opening any fittings.

Using the ESD Strap

Electronic boards are sensitive to electrostatic discharge (ESD). In order to prevent damage, always use an ESD strap when handling electronic boards and components.

1 Unwrap the first two folds of the band and wrap the exposed adhesive side firmly around your wrist.

2 Unroll the rest of the band and peel the liner from the copper foil at the opposite end.

3 Attach the copper foil to a convenient and exposed electrical ground.

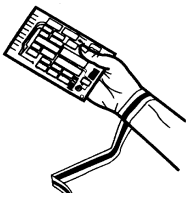


Figure 65 Using the ESD Strap

12
Maintenance

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Exchanging a Flow Cell 168
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Correcting Leaks 175
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This chapter describes the maintenance of the detector.

Overview of Maintenance

The following pages describe maintenance (simple repairs) of the detector that can be carried out without opening the main cover.

Table 22 Simple Repairs

Procedures	Typical Frequency	Notes
Deuterium lamp exchange	If noise and/or drift exceeds your application limits or lamp does not ignite.	A VWD test should be performed after replacement.
Flow cell exchange	If application requires a different flow cell type.	A VWD test should be performed after replacement.
Cleaning flow cell parts cleaning or exchange	If leaking or if intensity drops due to contaminated flow cell windows.	A pressure tightness test should be done after repair.
Leak sensor drying	If leak has occurred.	Check for leaks.
Leak handling system replacement	If broken or corroded.	Check for leaks.

Exchanging a Lamp

When If noise or drift exceeds application limits or lamp does not ignite.

Tools required Screwdriver POZI 1 PT3

Parts required

#	Part number	Description
1	G1314-60101	Deuterium lamp (with RFID tag)
1		or other Agilent recommended lamps

Preparations Turn the lamp OFF.

NOTE If you want to use an Agilent DAD lamp instead of the VWD lamp, you have to change the lamp settings in the *VWD Configuration* to the required lamp type. This ensures that the DAD lamp's filament heating is operated like in the DAD.

NOTE The specification are based on the the standard RFID tag lamp (G1314-60101) and may be not achieved when other lamp types or aged lamps are used.

WARNING

Injury by touching hot lamp

If the detector has been in use, the lamp may be hot.

➔ If so, wait for lamp to cool down.

WARNING

Injury by sharp metal edges

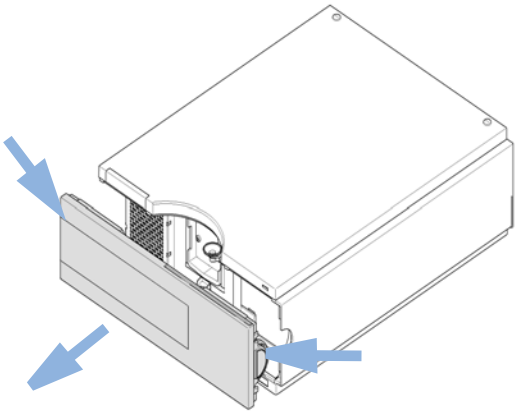
➔ Be careful when touching the RFI sheet metal at the rear of the fan. There are sharp edges.

CAUTION Electronic boards and components are sensitive to electrostatic discharge (ESD).

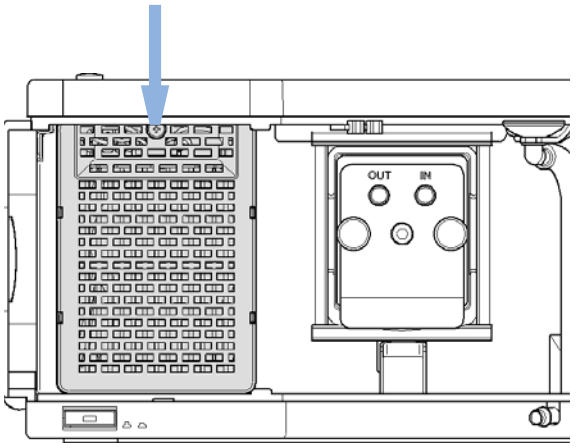
➔ To prevent accidental electrostatic discharge when coming into contact with components inside the instrument, touch one of the metal housing panels at the front of the instrument.

---

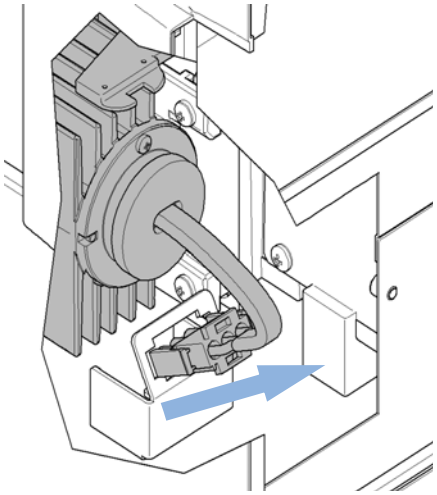
1 Press the release buttons and remove the front cover to have access to the front area.



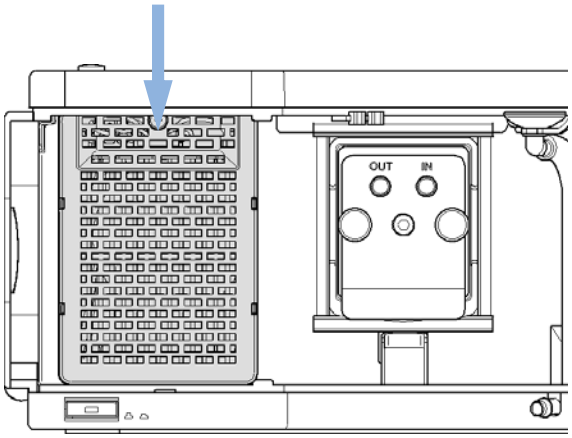
2 Unscrew the heater assembly and remove it.



3 Unscrew, disconnect and remove the lamp. Insert, fix and reconnect the lamp.



4 Replace the heater assembly.



Next Steps:

5 Replace the front cover.

6 Reset the lamp counter as described in the User Interface documentation (required for non-RFID tag lamps only).

7 Turn the lamp ON.

8 Give the lamp more than 10 minutes to warm-up.

9 Perform "Wavelength Verification/Calibration" on page 128 to check the correct positioning of the lamp.

NOTE If the detector was turned off during the replacement, then the detector requires a warm-up time of 60 minutes. No measurements should be performed during this time.

Exchanging a Flow Cell

When If application needs a different type of flow cell or the flow cell needs repair.

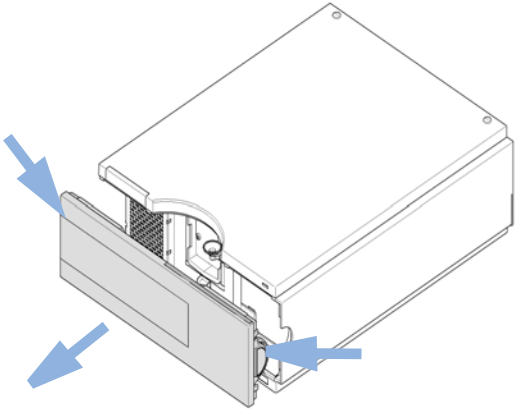
Tools required Two 1/4 inch wrenches for capillary connections

Parts required **Description**

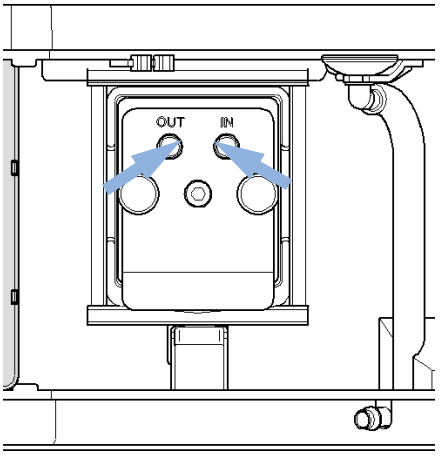
For flow cells, see "Overview of Maintenance Parts" on page 234.

Preparations Turn the lamp OFF.

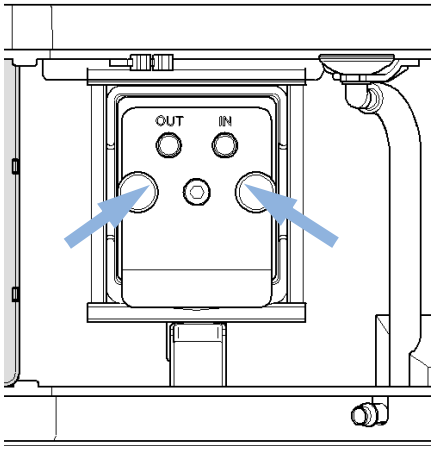
1 Press the release buttons and remove the front cover to have access to the flow cell area.



2 Disconnect the inlet and outlet capillaries.



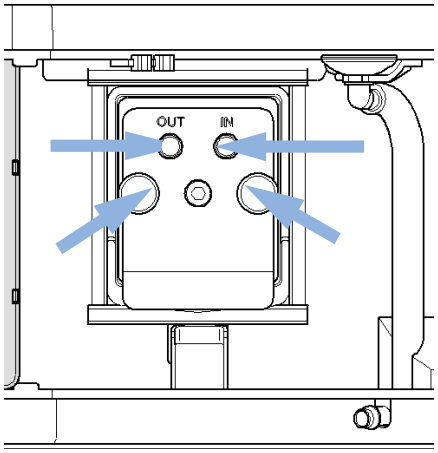
3 Unscrew the thumb screws parallel and remove the flow cell.



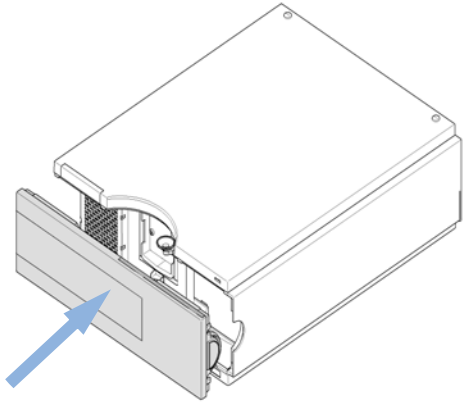
NOTE

If you want to maintain flow cell parts, see "Overview of Maintenance Parts" on page 234 or the information provided with your flow cell.

4 Replace the flow cell and fix the thumb screws. Reconnect the inlet and outlet capillaries to the flow cell.



5 Replace the front cover.



Next Steps:

6 To check for leaks, establish a flow and observe the flow cell (outside of the cell compartment) and all capillary connections.

7 Insert the flow cell.

8 Perform "Wavelength Verification/Calibration" on page 128 to check the correct positioning of the flow cell.

9 Replace the front cover.

Repairing the Flow Cells

Parts required	#	Description
	1	For details on flow cell see "Overview of Maintenance Parts" on page 234.

NOTE The shown cell parts will differ depending upon the flow cell type. For detailed parts schematics, refer to above mentioned pages.

1 - Cell screw
2 - Conical springs
3 - Ring #1 PEEK
4 - Gasket #1 (small hole)
5 - Window Quartz
6 - Gasket #2 (large hole)
7 - Ring #2 PEEK
8 - RFID tag

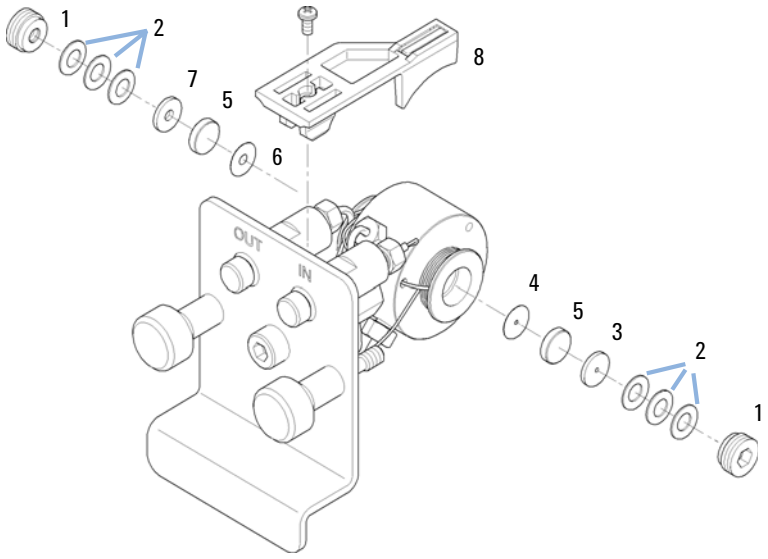


Figure 66 Standard Flow Cell

1 Disassembling the Flow Cell.

a Unscrew the cell screw using a 4-mm hexagonal wrench.

b Remove the SST rings using a pair of tweezers.

CAUTION

Scratched window surfaces by tweezers

Window surfaces can easily be scratched by using tweezers for removing the windows.

➔ Do not use tweezers to remove windows

c Use adhesive tape to remove the peek ring, the window and the gasket.

d Repeat step 1 through step 3 for the other window (keep the parts separate - otherwise they could be mixed!).

2 Cleaning the Flow Cell Parts

a Pour isopropanol into the cell hole and wipe clean with a piece of lint-free cloth.

b Clean the windows with ethanol or methanol. Dry it with a piece of lint-free cloth.

NOTE

Always use new gaskets.

3 Reassembling the Flow Cell

a Hold the flow cell cassette horizontally and place gasket in position. Ensure both cell holes can be seen through the holes of gasket.

NOTE

The semi-micro #1 and #2 gaskets (items 6 and 7, "Semi-micro Flow Cell 6 mm / 5 µl" on page 240) look very similar. Do not mix them up.

b Place the window on gasket.

c Place the peek ring on the window.

d Insert the conical springs. Make sure the conical springs point towards the window. Otherwise tightening the cell screw might break the window.

e Screw the cell screw into the flow cell and tighten the screw.

4 Repeat the procedure for the other cell side.

5 Reconnect the capillaries.

6 Perform a leak test. If OK, insert the flow cell.

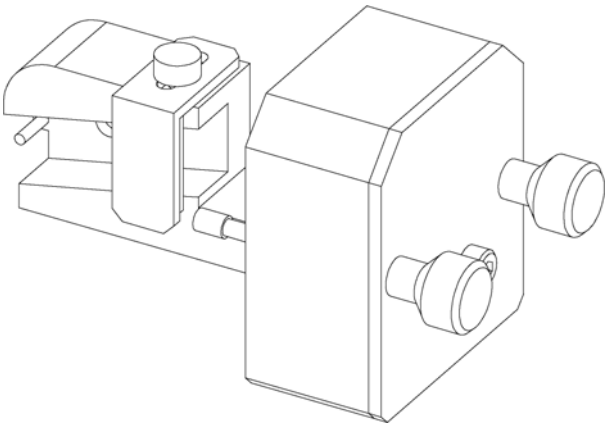
7 Perform “Wavelength Verification/Calibration” on page 128 to check the correct positioning of the flow cell.

8 Replace the front cover.

Using the Cuvette Holder

This cuvette holder can be placed instead of a flow cell in the variable wavelength detector. Standard cuvettes with standards in it, for example, National Institute of Standards & Technology (NIST) holmium oxide solution standard, can be fixed in it.

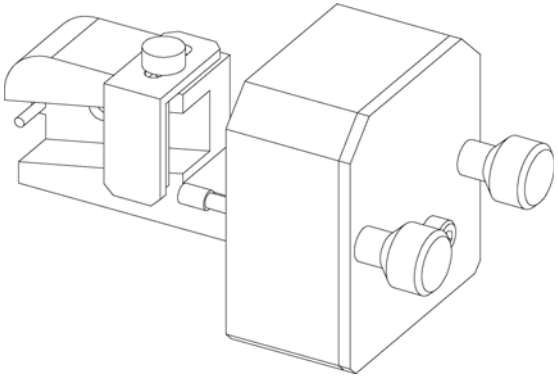
This can be used for wavelength verifications.



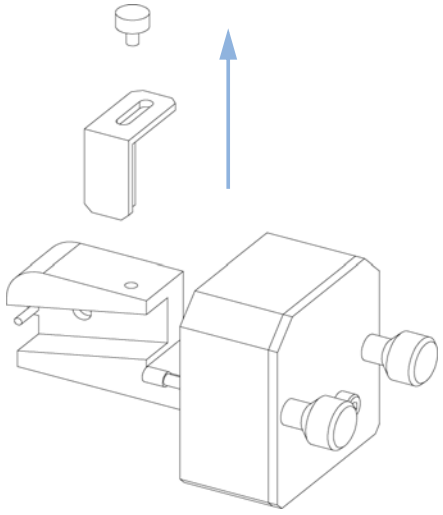
Parts required

#	Part number	Description
1	G1314-60200	Cuvette Holder
1		Cuvette with the “standard”, e.g. NIST certified holmium oxide sample

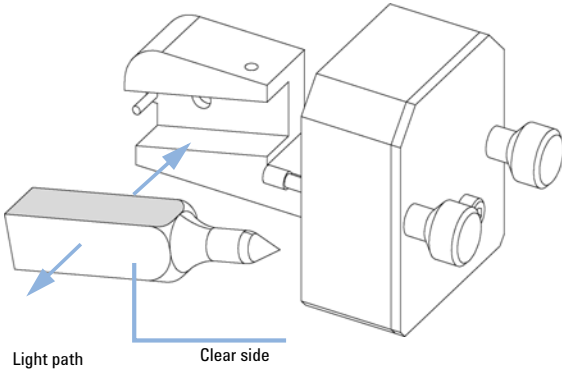
1 Locate the cuvette holder on the desk.



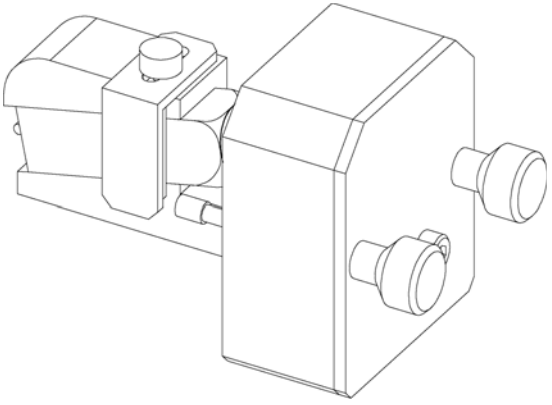
2 Unscrew the bracket.



3 Insert the cuvette with the sample into the holder. The clear side of the cuvette must be visible.



4 Replace the bracket and fix the cuvette.



Next Steps:

5 Install the cuvette holder in the instrument.

6 Perform your Wavelength Verification/Calibration "Wavelength Verification/Calibration" on page 128 to check the correct position of the cuvette holder.

Correcting Leaks

When If a leakage has occurred in the flow cell area or at the capillary connections.

Tools required Tissue
Two 1/4 inch wrenches for capillary connections

Parts required **Description**
None

1. Remove the front cover.
2. Use tissue to dry the leak sensor area.
3. Observe the capillary connections and the flow cell area for leaks and correct, if required.
4. Replace the front cover.

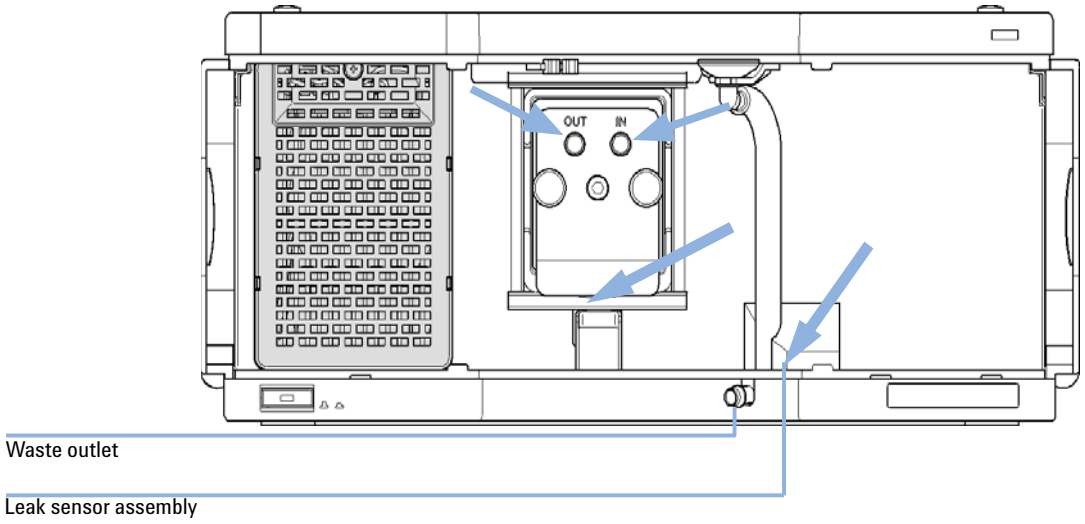


Figure 67 Drying the Leak Sensor

Replacing Leak Handling System Parts

When If the parts are corroded or broken.

Tools required None

Parts required **Description**

For parts refer to "Leak Parts" on page 245

1. Remove the front cover to have access to the leak handling system.
2. Pull the leak funnel out of the leak funnel holder.
3. Pull the leak funnel with the tubing out of its location.
4. Replace the leak funnel and/or the tubing.
5. Insert the leak funnel with the tubing in its position.
6. Insert the leak funnel into the leak funnel holder.
7. Replace the front cover.

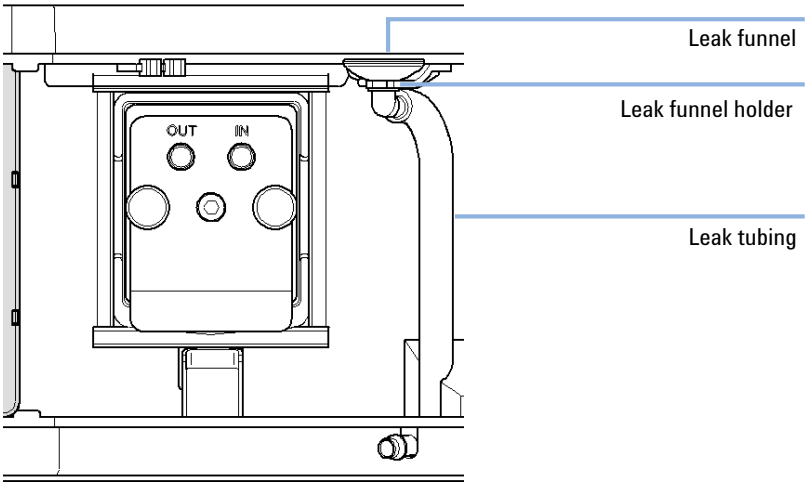


Figure 68 Replacing Waste Handling System Parts

Replacing the Module's Firmware

When

The installation of newer firmware might be necessary
- if a newer version solves problems of older versions or
- to keep all systems on the same (validated) revision.

The installation of older firmware might be necessary
- to keep all systems on the same (validated) revision or
- if a new module with newer firmware is added to a system or
- if third part control software requires a special version.

Tools required

- LAN/RS-232 Firmware Update Tool or
- Agilent Lab Monitor & Diagnostic Software (LMD)
- Instant Pilot G4208A (only if supported by module)
- Control Module G1323B (only if supported by module)

Parts required

Description
Firmware, tools and documentation from Agilent web site

Preparations

Read update documentation provided with the Firmware Update Tool.

To upgrade/downgrade the module's firmware the following steps have to be performed:

1 Download the required module firmware, the latest LAN/RS-232 FW Update Tool and the documentation from the Agilent web.
   - http://www.chem.agilent.com/scripts/cag_firmware.asp.

2 Load the firmware into the module as described in the documentation.

NOTE

The initial firmware revision of the G1314D VWD and the G1314E VWD SL Plus is B.06.20 (main and resident). No further downgrade is possible.

Due to a different hardware platform, there is no way to convert a G1314D VWD and the G1314E VWD SL Plus to a G1314A/B VWD or G1314C VWD SL.

13
Repair

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Changing the Type and Serial Number 217
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This chapter gives instructions on how to repair the detector.

Cautions and Warnings

WARNING

Module is partially energized when switched off, as long as the power cord is plugged in.

Risk of stroke and other personal injury. Repair work at the module can lead to personal injuries, e. g. shock hazard, when the module cover is opened and the instrument is connected to power.

➔ Never perform any adjustment, maintenance or repair of the module with the top cover removed and with the power cord plugged in.

➔ The security lever at the power input socket prevents that the module cover is taken off when line power is still connected. Never plug the power line back in when cover is removed.

NOTE

The electronics of the detector will not allow operation of the detector when the top cover and the top foam are removed. A safety light switch on the main board will inhibit the operation of the fan immediately. Voltages for the other electronic components will be turned off after 30 seconds. The status lamp will light up red and an error will be logged into the logbook of the user interface. Always operate the detector with the top covers in place.

WARNING

Toxic and hazardous solvents

The handling of solvents and reagents can hold health risks.

➔ When working with solvents observe appropriate safety procedures (for example, goggles, safety gloves and protective clothing) as described in the material handling and safety data sheet supplied by the solvent vendor, especially when toxic or hazardous solvents are used.

CAUTION

Electronic boards and components are sensitive to electrostatic discharge (ESD).

ESD can damage electronic boards and components.

➔ In order to prevent damage always use ESD protection when handling electronic boards and components.

CAUTION

Electronic boards and components are sensitive to electrostatic discharge (ESD).

➔ To prevent accidental electrostatic discharge when coming into contact with components inside the instrument, touch one of the metal housing panels at the front of the instrument.

WARNING

Eye damage by detector light

Eye damage may result from directly viewing the light produced by the deuterium lamp used in this product.

➔ Always turn the deuterium lamp off before removing it.

Removing the Top Cover and Top Foam

When For all repairs inside the detector.

Tools required Screwdriver POZI 1 PT3

Parts required **Description**

Depends on the work inside and the following procedures.

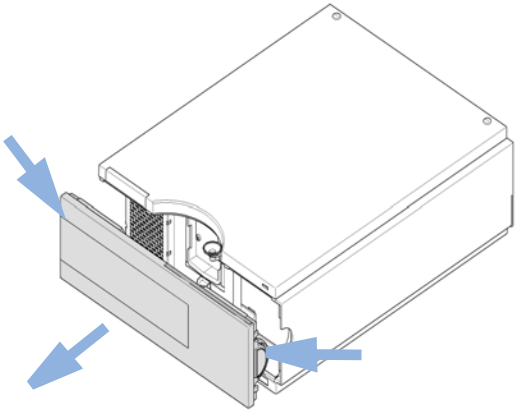
Preparations Turn OFF the detector.

Disconnect the power cable.

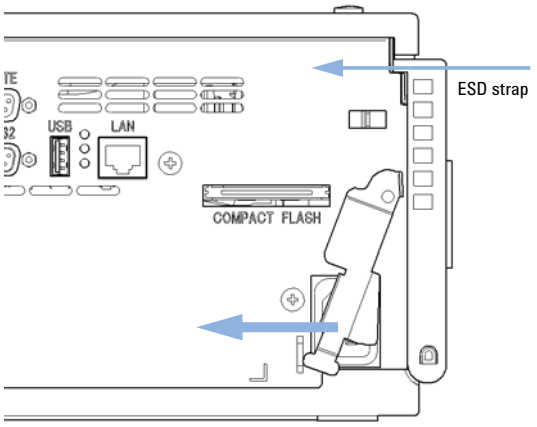
Disconnect capillaries.

Remove detector from the system and place it on the working bench.

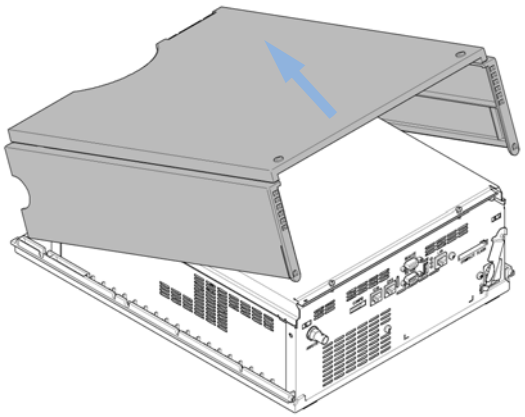
1 Press the release buttons and remove the front cover. Unclip and remove the waste funnel assembly.



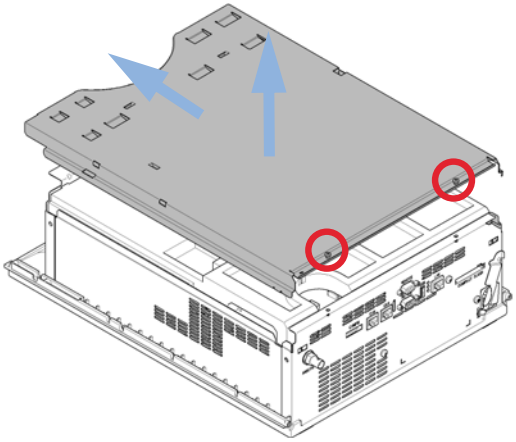
2 Install the ESD strap. Move the power lock across the power inlet.



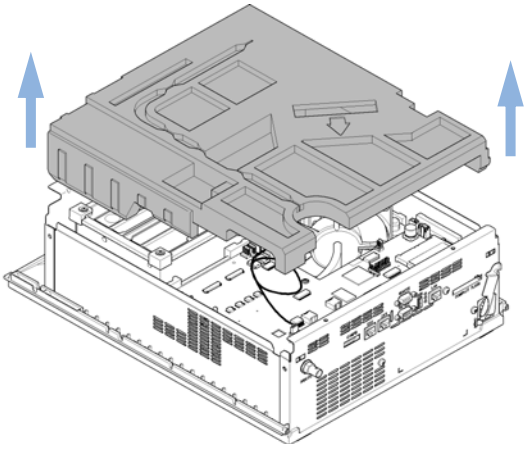
3 Lift the cover and slide it towards the rear.



4 Unscrew the screws at the rear of the top plate, slide the plate towards the front and remove it.



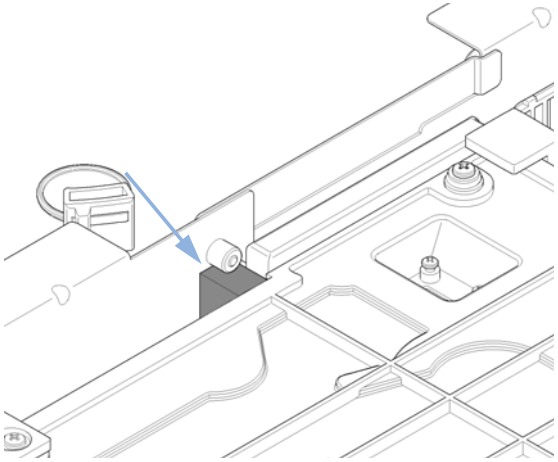
5 Carefully remove the top foam from the detector.



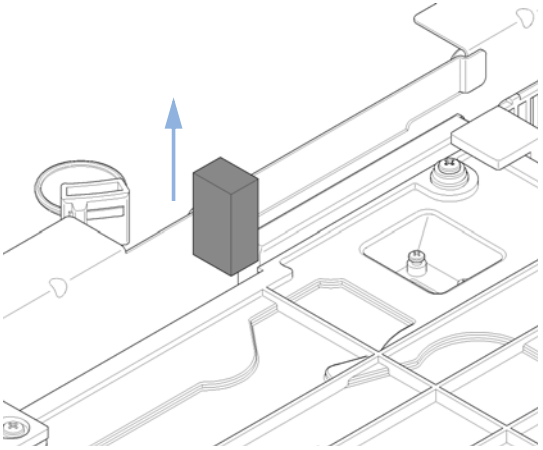
NOTE

First units have pre-released foam parts. Therefore a single piece of foam is located between optical unit and front sheet metal, right of the flow cell to close the air flow.

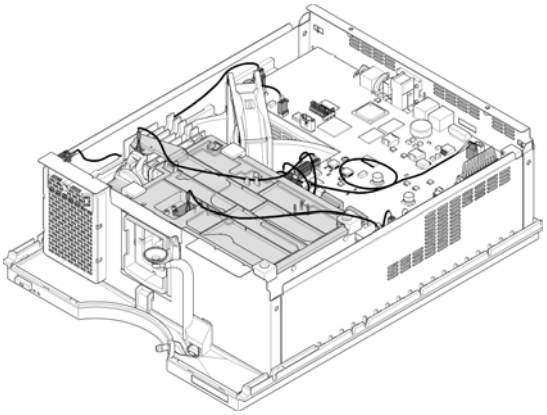
6 Location from the pre-release foam part.



7 Remove the pre-release foam part.



8 The detector is now open for further repairs.



NOTE

Do not connect a power plug to module after removing the top covers.

A safety light switch on the main board will turn off fan (immediately) and electronic (after 30 seconds) to avoid the operation with removed covers. An error will be generated (status lamp lights red) and the logbook will show an error message.

Locate the Main Assemblies

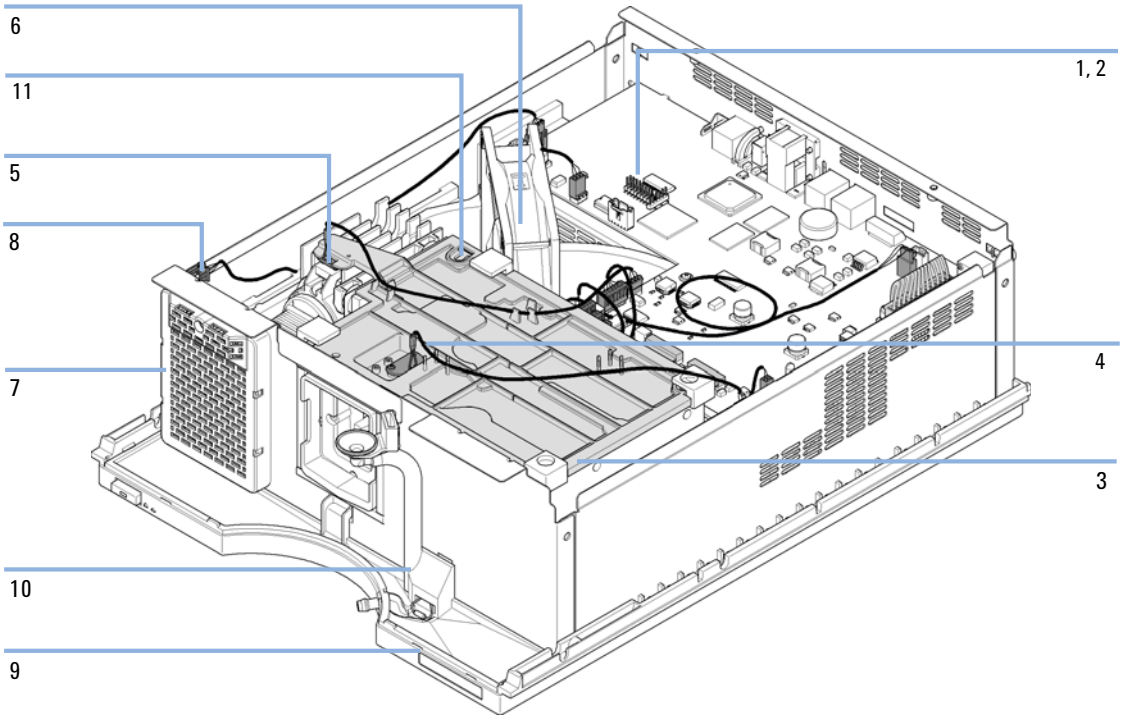


Figure 69 Location of Main Assemblies

1	Main Board	7	Heater Assembly
2	Main Power Supply	8	Heater Interface Board, Cable
3	Optical Unit	9	Leak Sensor
4	RFID Tag Reader Cell	10	Leak Handling
5	RFID Tag Reader Lamp	11	Temperature Sensor/Holder
6	Fan		

Replacing the Temperature Sensor

When If the temperature sensor is defective.

Tools required Screwdriver POZI 1 PT3

Parts required

#	Part number	Description
1	G1314-65802	Temperature Sensor Assembly (includes board and cable)
1	G1314-44016	Temperature Sensor Holder

Preparations

Turn OFF the detector.

Disconnect the power cable.

Disconnect capillaries.

Remove detector from the system and place it on the working bench.

Remove the Front Panel, the Closure, the Metal Cover and the Top Foam, see "Removing the Top Cover and Top Foam" on page 182.

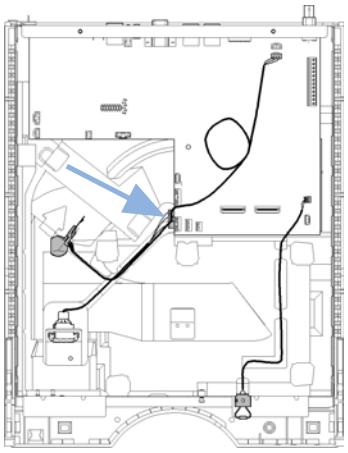
Remove the Heater Assembly, see "Replacing the Heater Assembly" on page 195.

Remove the optical unit, see "Removing the Optical Unit" on page 201.

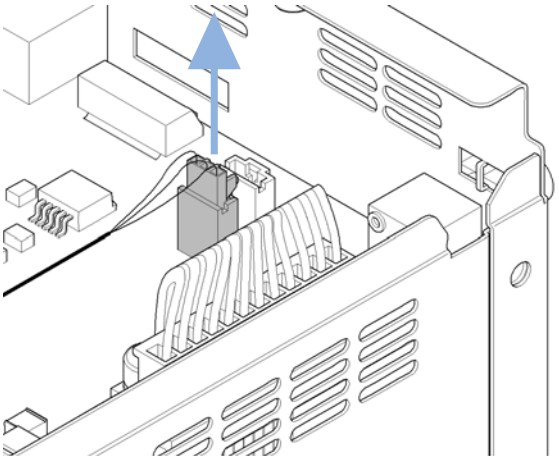
Disconnect and remove the fan assembly.

NOTE First units have pre-released foam parts. Therefore a single piece of foam is located between optical unit and front sheet metal, right of the flow cell to close the air flow, see Chapter , "Removing the Top Cover and Top Foam" on page 182 .Step 6 and 7.

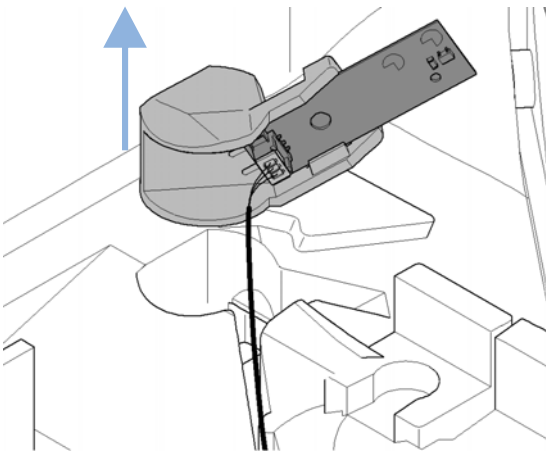
1 Unplug the lamp connector from the main board.



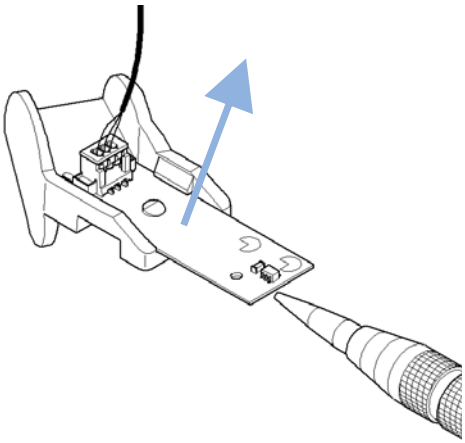
2 Disconnect the temperature sensor from the main board (TEMP SENS 2).



3 Pull the Temperature Sensor out of the foam.

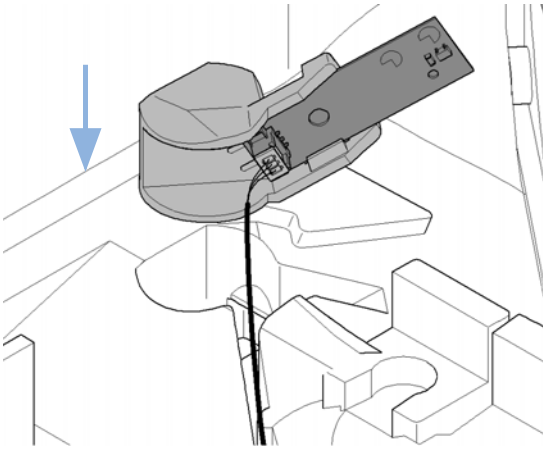


4 Carefully lift the board from the holder using a small flat screw driver.

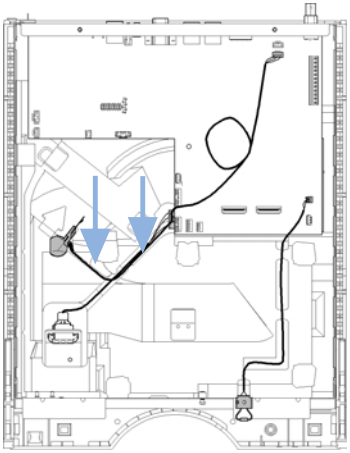


5 Add the new Temperature Sensor to the holder. Assure that the board fits flat on the holder.

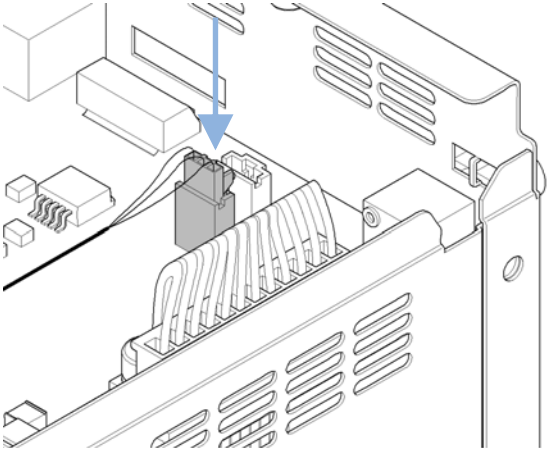
6 Insert the Temperrature Sensor into the foam.



7 Route the sensor cable in its channel in the foam towards the main board (should come up between the connector for grating and filter).



8 Reconnect the Temperature Sensor Cable to the connector TEMP SENS 2 on the main board



Next Steps:

9 Replace the Top Foam, the Metal Cover, the Closure and the Front Panel, see "Installing the Foam and the Top Cover" on page 229.

10 Replace the detector in the system.

11 Replace and reconnect the fan, see "Exchanging the Fan" on page 190, step 2.

12 Replace the optical unit, see "Installing the Optical Unit" on page 204.

13 Replace the Top foam, see "Installing the Foam and the Top Cover" on page 229

14 Replace the heater assembly, see "Replacing the Heater Assembly" on page 195.

Exchanging the Fan

When If the fan is defective or noisy.

Tools required Screwdriver POZI 1 PT3

Parts required

#	Part number	Description
1	3160-1016	Fan

Preparations

Turn OFF the detector.

Disconnect the power cable.

Disconnect capillaries.

Remove detector from the system and place it on the working bench.

Remove the Front Panel, the Closure, the Metal Cover and the Top Foam, see "Removing the Top Cover and Top Foam" on page 182.

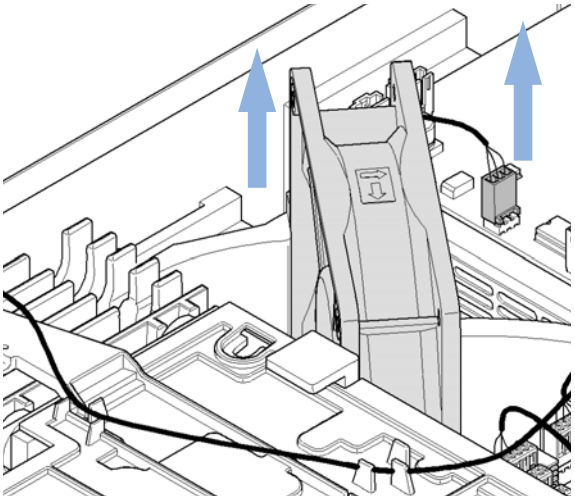
Remove the Heater Assembly, see "Replacing the Heater Assembly" on page 195.

WARNING

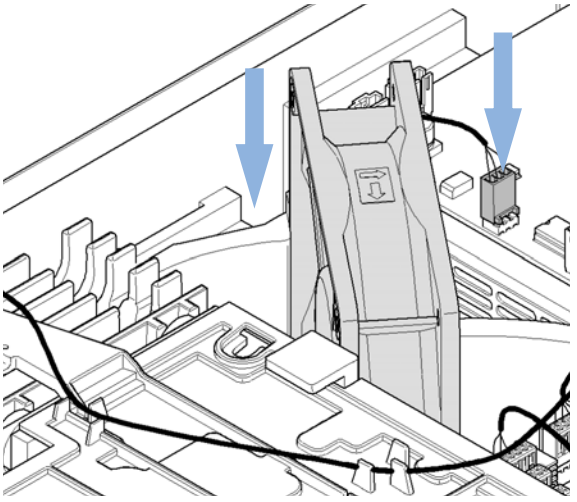
Injury by sharp metal edges

➔ Be careful when touching the RFI sheet metal at the rear of the fan. There are sharp edges.

1 Disconnect the fan from the main board and remove the fan assembly.



2 Fit the fan assembly into its location. Replace and reconnect the fan assembly to the main board.



NOTE

The fan must be installed in the correct orientation to ensure optimum cooling and operation of the detector. The direction of air flow is from the front towards the rear.

3 Next Steps

- Replace the Top Foam, the Metal Cover, the Closure and the Front Panel, see "Installing the Foam and the Top Cover" on page 229.
- Replace the detector in the system.

Replacing the RFID Tag Reader (Lamp or Flow Cell)

When If the RFID tag reader is defective.

Tools required Screwdriver POZI 1 PT3

Preparations Turn OFF the detector.

Disconnect the power cable.

Disconnect capillaries.

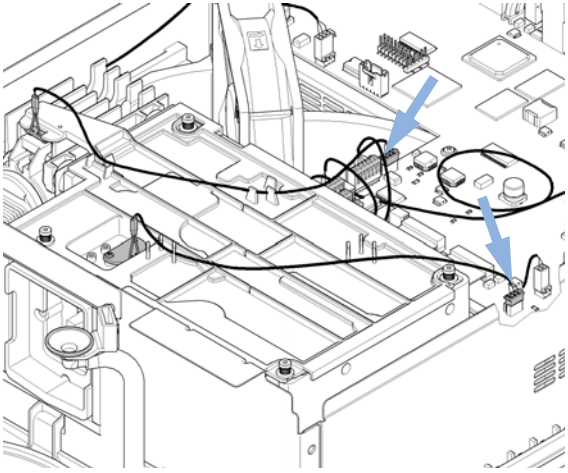
Remove detector from the system and place it on the working bench.

Remove the Front Panel, the Closure, the Metal Cover and the Top Foam, see "Removing the Top Cover and Top Foam" on page 182.

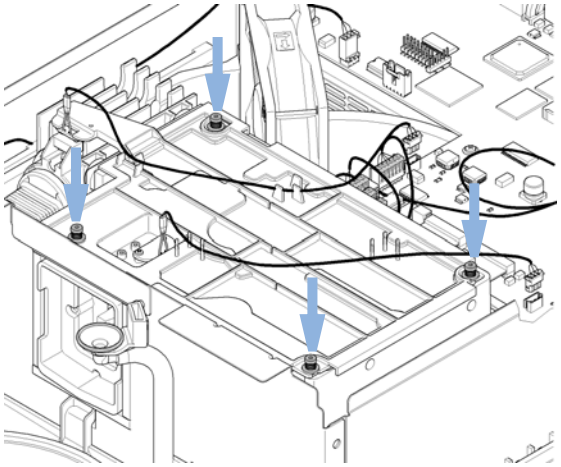
Remove the Heater Assembly, see "Replacing the Heater Assembly" on page 195.

Remove the optical unit, see "Removing the Optical Unit" on page 201.

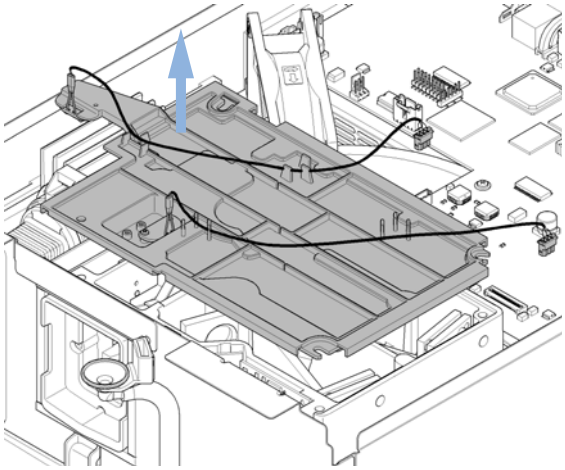
Disconnect and remove the fan assembly.

1 Disconnect the sensor cable(s) from the main board. 	**2** If you want to replace the RFID Reader Cell continue with step 5 (without performing steps 3 and 4).

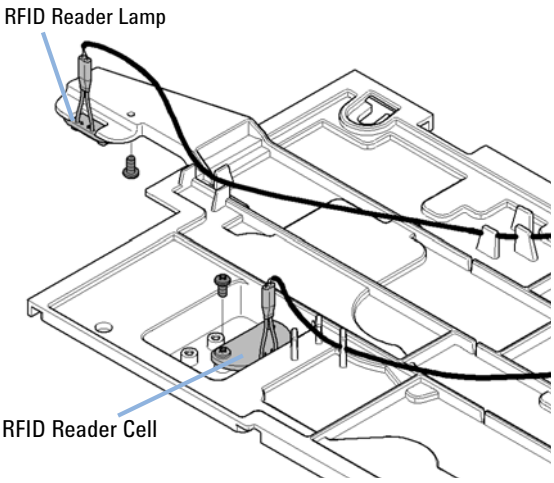
3 If you want to replace the RFID Reader Lamp, unscrew the four screws the fix the cover of the optical. Don't lose the screws, o-rings and spring washers.



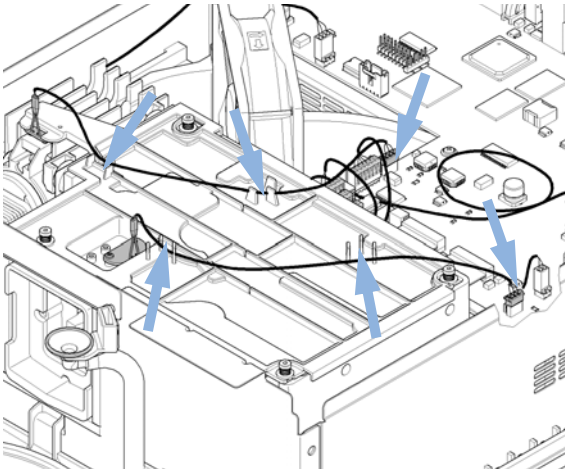
4 Remove the optical cover from the housing.



5 Carefully unscrew the assembly, replace it by the new assembly and fix it with the two screw.



6 Replace the optical cover and fix the four screws. The order of the screw parts is shown below.

7 Reconnect the connectors to the main board and route the sensor cables through the recesses on the optical cover. 	**8** Replace and reconnect the fan, see "Exchanging the Fan" on page 190, step 2.

Replacing the Heater Assembly

When If Heater Assembly is defective.
The heater has to be removed for other replacements.

Tools required Screwdriver POZI 1 PT3

Parts required

#	Part number	Description
1	G1314-60114	Heater Assenbly

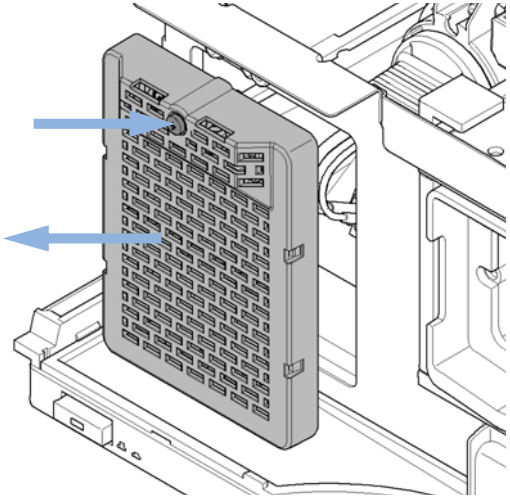
Preparations Turn OFF the detector.

WARNING

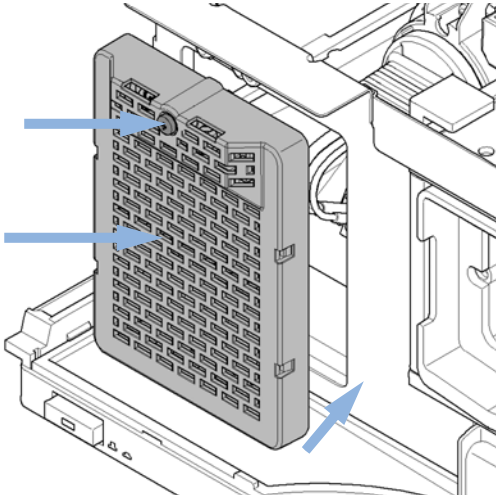
Injury by sharp metal edges

➔ Be careful when touching the RFI sheet metal at the rear of the fan. There are sharp edges.

1 Unscrew the Heater Assembly and remove it from its location.



2 Insert the Heater Assembly (bottom first) and fix the screw.



3 Replace the front cover or continue with other repairs.

Replacing the Heater Interface/Cable

When

If the Heater Assembly, the Heater Interface Board or the Heater Cable is defective.

Tools required

Screwdriver POZI 1 PT3

Parts required

#	Part number	Description
1	G1314-60114	Heater Assembly
1	G1314-67000	Heater Interface Board Kit (includes 4 rivets)
1	G1314-81010	Heater Cable

Preparations

Turn OFF the detector.

Disconnect the power cable.

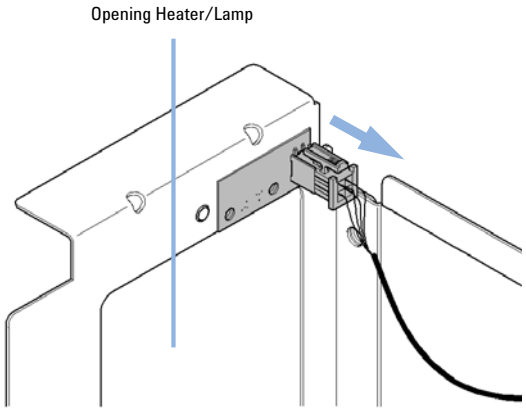
Disconnect capillaries.

Remove detector from the system and place it on the working bench.

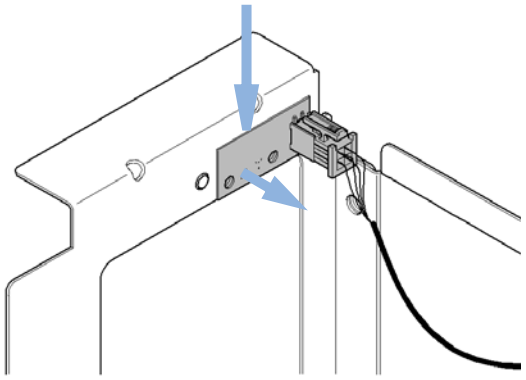
Remove the Front Panel, the Closure, the Metal Cover and the Top Foam, see "Removing the Top Cover and Top Foam" on page 182.

Remove the Heater Assembly, see "Replacing the Heater Assembly" on page 195.

1 Disconnect the cable from the connector on the Interface Board.

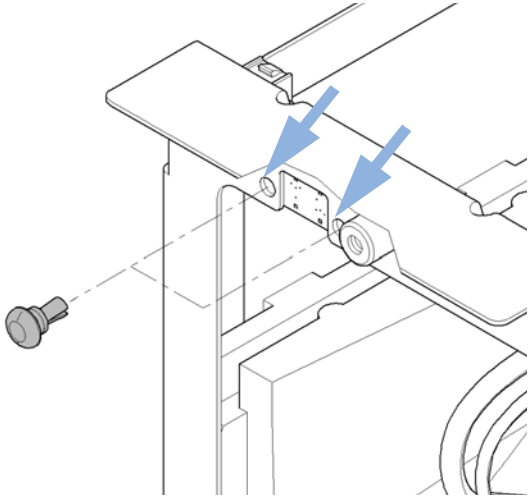


2 Insert a flat screw driver between board and sheet metal and remove the board from its two plastic rivets (they will break off and are not reusable).

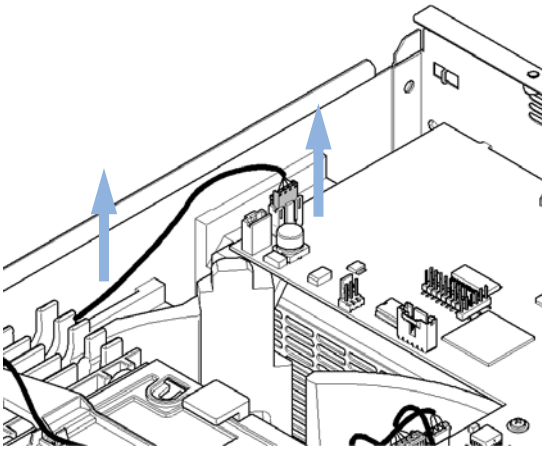


3 Use the new rivets provided with the new Interface Board to fix the new board.

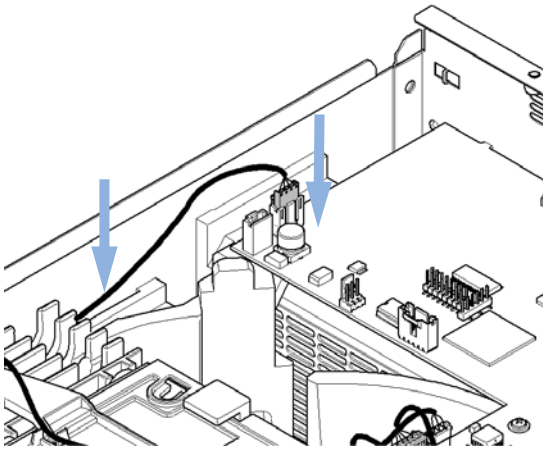
4 Insert the first rivet through the hole and press the interface board across. Redo with the second rivet.



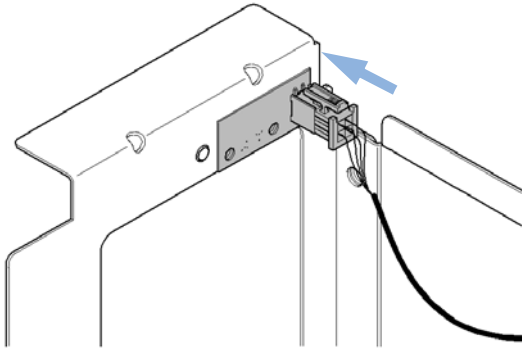
5 Disconnect the cable at the connector on the Main Board close to the fan. Pull the cable out of the foam.



6 Insert the new cable into the foam. Reconnect the connectors to the Interface Board and the Main Board.



7 Reconnect the cable to the Interface Board.



8 Next Steps

- Replace the Top Foam, the Metal Cover, the Closure and the Front Panel, see "Installing the Foam and the Top Cover" on page 229.
- Replace the detector in the system.

Repairs in the Optical Unit

NOTE Troubleshooting should be performed with a clean and bubble-free flow cell and with a new deuterium lamp or one in good condition.

In case of the following problem symptoms call your local Agilent Technologies service representative for help:

- low intensity readings after replacement of lamp and/or cleaning of the flow cell and/or source lens assembly,
- calibration failures (zero-order, holmium oxide lines or 656 nm emission lines),
- excessive noise and/or drift,
- grating drive failures,
- filter drive failures, and
- no intensity readings on one or both, the reference and/or sample side.

Special Notes

NOTE There are no repairs within the optical unit possible since this requires special knowledge and special tools affecting the alignment of optical components. In case of problems, the complete optical unit must be replaced.

NOTE Incase of problems that can be related to the optical unit (e.g. intensity or calibration problems), the optical unit cover may be opened for visual check of contaminated or broken/loose parts (like mirrors or grating).

NOTE If optical components (like mirrors or grating) show signs of contaminations, this will reduce the light throughput drastically. In this case read "Contaminated Mirrors and Grating" on page 200 first.

Contaminated Mirrors and Grating

Under some specific environmental conditions it might happen that the efficiency of the mirrors and the grating is decreasing faster than normal. This results in low photo current readings on sample and reference side.

NOTE Contaminated mirrors and the grating result into a replacement of the optical unit.

Removing the Optical Unit

When When other assemblies have to be removed or when defective.

Tools required Screwdriver POZI 1 PT3

Parts required

#	Part number	Description
1	G1314-69062	Optical unit G1314D/E (exchange part)
1	G1314-60062	Optical unit G1314D/E

Preparations

Turn OFF the detector.

Disconnect the power cable.

Disconnect capillaries.

Remove detector from the system and place it on the working bench.

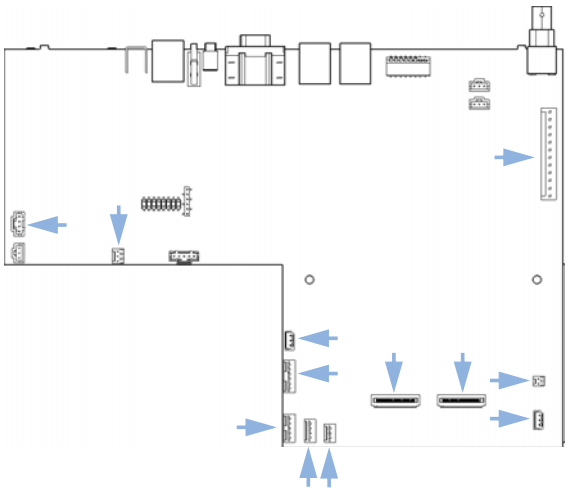
Remove the Front Panel, the Closure, the Metal Cover and the Top Foam, see "Removing the Top Cover and Top Foam" on page 182.

Remove the deuterium lamp (if optical unit will be replaced).

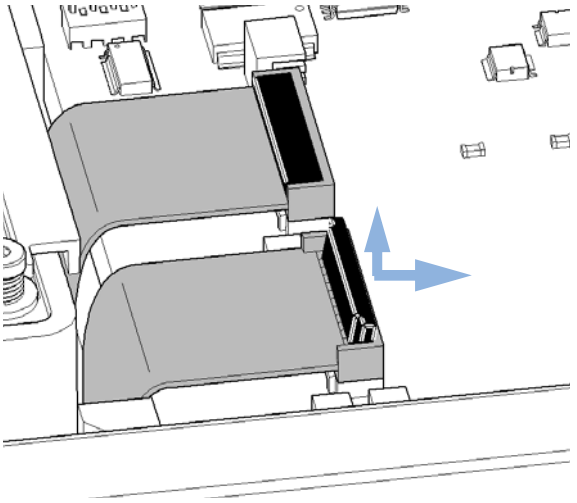
Remove the flow cell.

NOTE For ESD information refer to "Cautions and Warnings" on page 180.

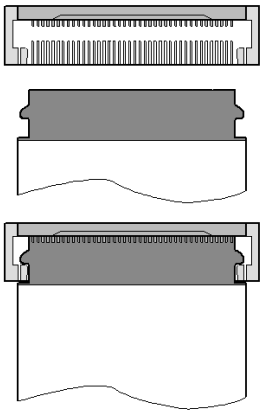
1 Disconnect all cables from the main board.



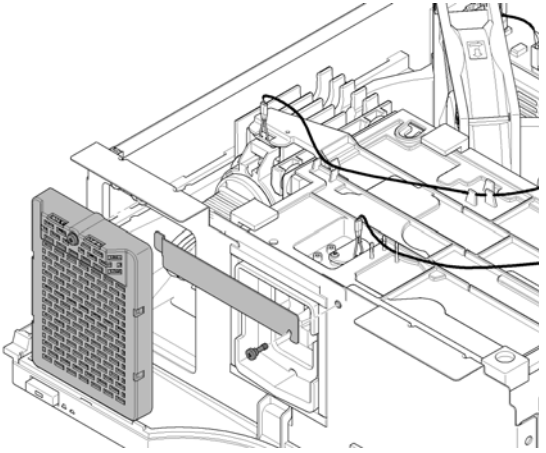
2 To disconnect the flat cables from its connectors lift the black holder of the connector using a small flat screw driver (as shown in the bottom connector).



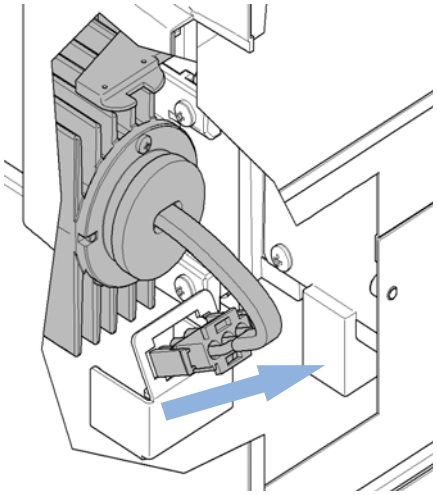
3 Details of connector/cable.



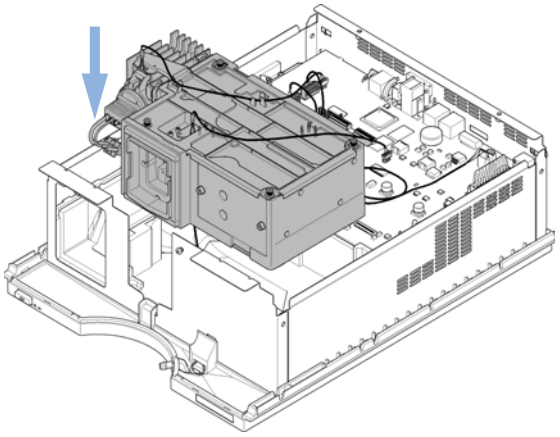
4 Remove the Heater Assembly and the Bracket that secures the optical unit.



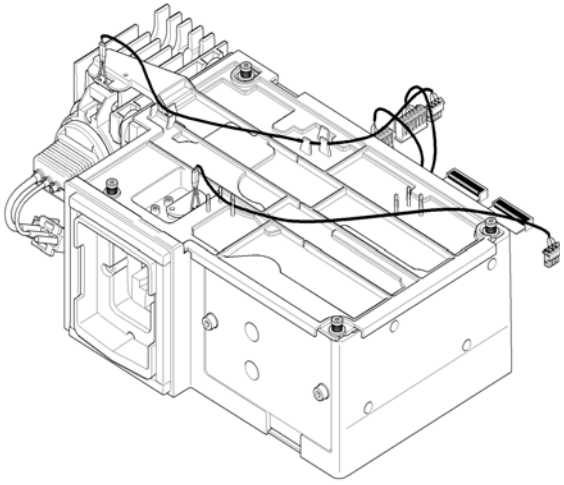
5 Disconnect the deuterium lamp at the lamp interface connector.



6 Lift the optical unit out of the instrument.



7 Place the optical unit on a bench.



Installing the Optical Unit

When To continue the installation

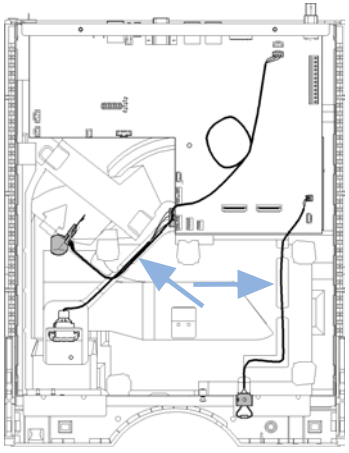
Tools required Screwdriver POZI 1 PT3
Wrench 1/4 inch

Preparations
- The power supply, the temperature sensor, the fan and the main board are already installed.

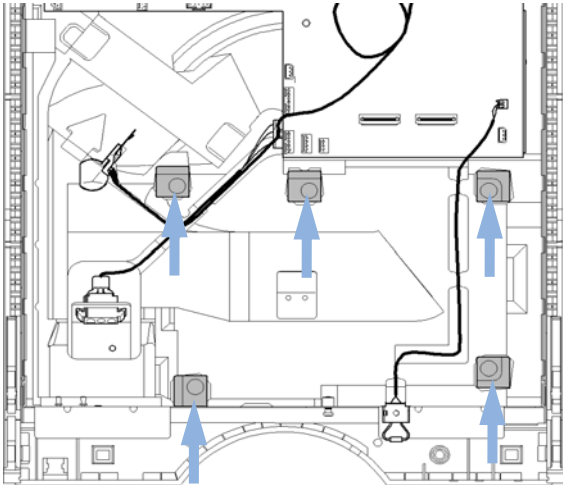
NOTE For ESD information refer to "Cautions and Warnings" on page 180.

---

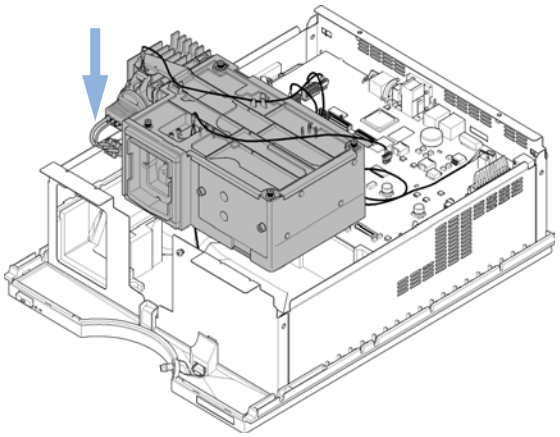
1 Observe that the leak sensor cable and the lamp cable are fitted in their foam channels.



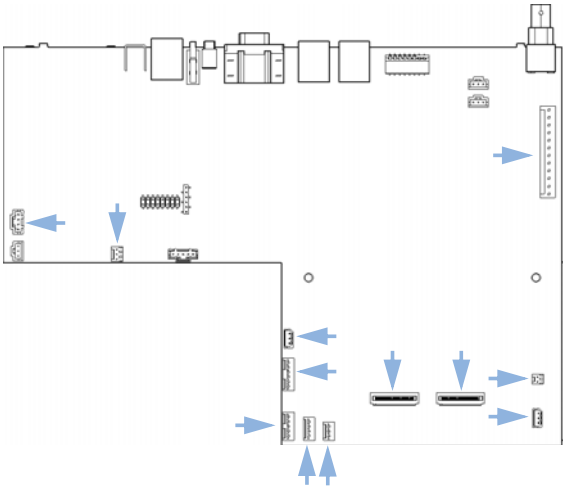
2 Observe that all bumpers in their location in the bottom foam.



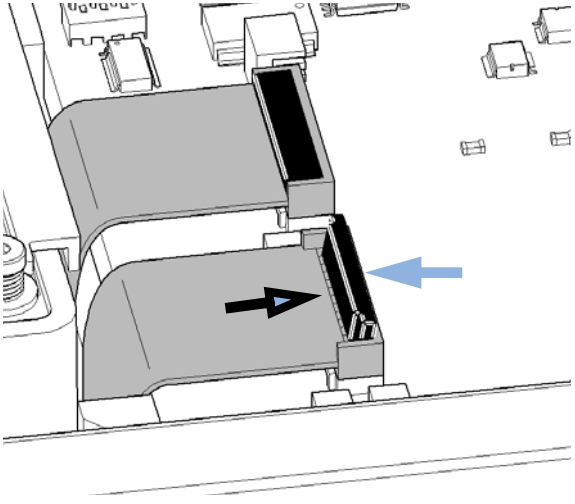
3 Place the optical unit into the bottom foam.



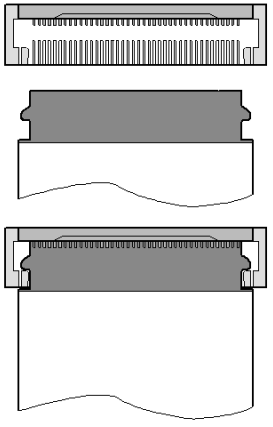
4 Reconnect all cables to the main board.

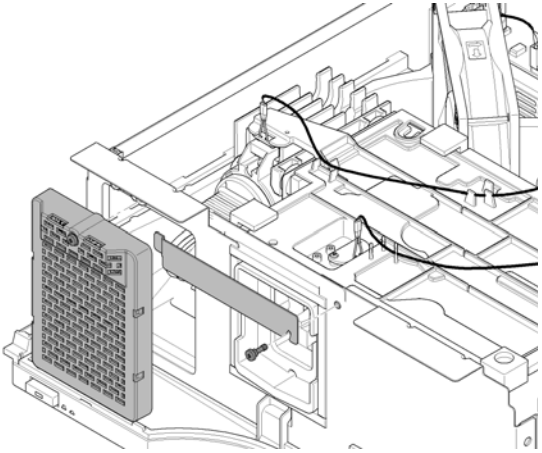


5 Slide the flat cable into the connector and flip the black holder back. For details see next figure.



6 Details of connector/cable.



7 Replace the Heater Assembly and the plate that secures the optical unit. 	**8** Next Steps • Replace the Metal Cover, the Closure and the Front Panel, see "Installing the Foam and the Top Cover" on page 229. • Replace the detector in the system.

Exchanging the Leak Sensor

When When leak sensor is defective.

Tools required Screwdriver POZI 1 PT3

Preparations Turn OFF the detector.

Disconnect the power cable.

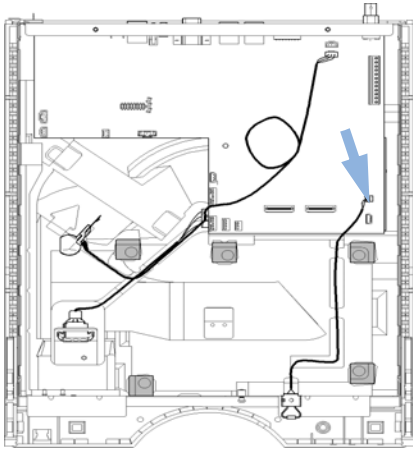
Disconnect capillaries.

Remove detector from the system and place it on the working bench.

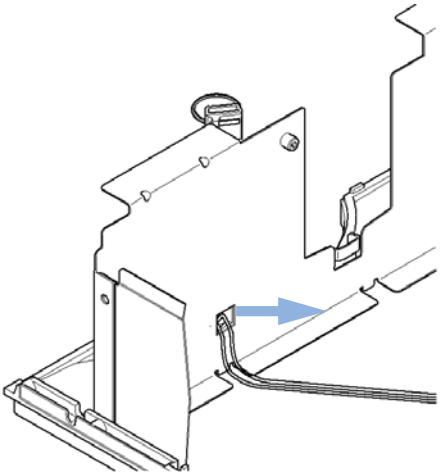
Remove the Front Panel, the Closure, the Metal Cover and the Top Foam, see "Removing the Top Cover and Top Foam" on page 182.

Remove the optical unit, see "Removing the Optical Unit" on page 201.

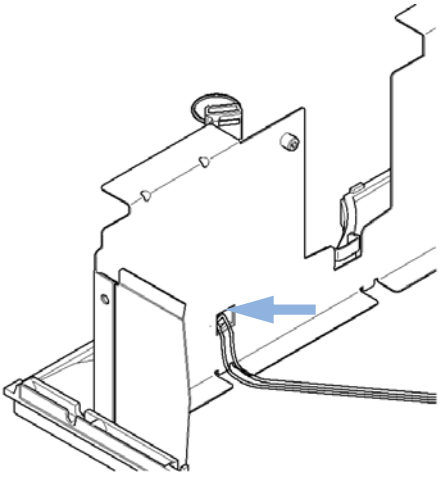
1 Disconnect the leak sensor assembly on the main board.



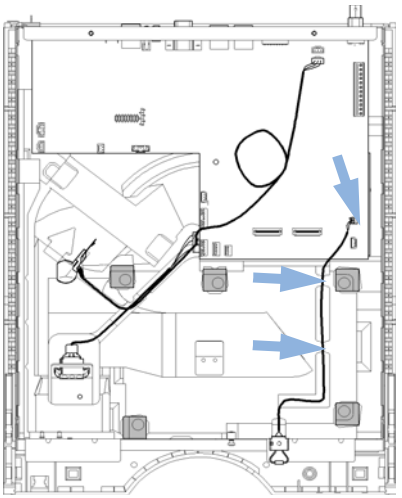
2 Remove the leak sensor assembly from the leak panel.



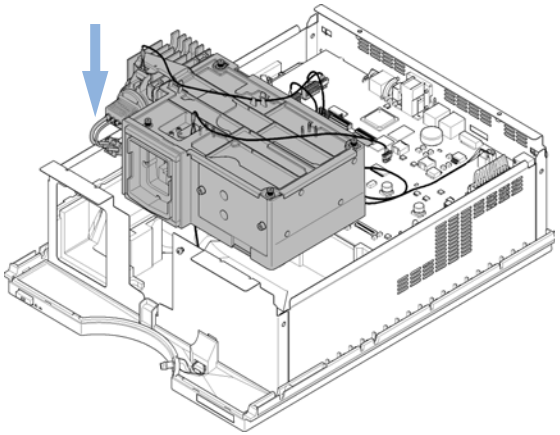
3 Replace the Leak Sensor.



4 Route the Leak Sensor Cable back through the opening and fit it into the bottom foam channel.



5 Install the Optical Unit, see "Installing the Optical Unit" on page 204.



Next Steps:

6 Replace the Top Foam, the Metal Cover, the Closure and the Front Panel, see "Installing the Foam and the Top Cover" on page 229.

7 Replace the detector in the system.

Replacing Status Light Pipe

When When part is broken

Tools required Screwdriver POZI 1 PT3

Parts required

#	Part number	Description
1	5041-8384	Status light pipe

Preparations Turn OFF the detector.

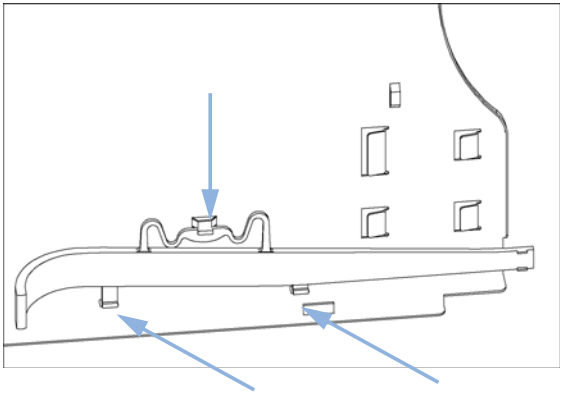
Disconnect the power cable.

Disconnect capillaries.

Remove detector from the system and place it on the working bench.

Remove the Front Panel, the Closure and the Metal Cover, see "Removing the Top Cover and Top Foam" on page 182.

1 The status light pipe is clipped into the top cover.



2 Next Steps

- Replace the Metal Cover, the Closure and the Front Panel, see "Installing the Foam and the Top Cover" on page 229.
- Replace the detector in the system.

Exchanging the Main Board and Power Supply

Prerequisites

When

If the detector main board is defective.

Tools required

Screwdriver POZI 1 PT3

Hexagonal wrenches 5 mm and 14 mm

Parts required

#	Part number	Description
1	G1314-69080	Detector main board VWM G1314E SL Plus (exchange assembly)
1	G1314-65080	Detector main board VWM G1314E SL Plus
1	G1314-69070	Detector main board VWM G1314D (exchange assembly)
1	G1314-65070	Detector main board VWM G1314D
1	0950-2528	Main Power Supply

Preparations

Turn OFF the detector.

Disconnect the power cable.

Disconnect capillaries.

Remove detector from the system and place it on the working bench.

Remove the Front Panel, the Closure, the Metal Cover and the Top Foam, see "Removing the Top Cover and Top Foam" on page 182.

Remove the Heater Assembly, see "Replacing the Heater Assembly" on page 195.

Follow the detailed instructions:

1. Removal of Main Board
2. Replacing Main Power Supply/Power Light Pipe
3. Installation of Main Board
4. Next Steps

Removal of Main Board

NOTE For ESD information refer to "Cautions and Warnings" on page 180.

1 Unscrew the nut/spring/washer from the analog output (14 mm wrench).
2 Unscrew the nuts from the Remote and RS-232 connector (5 mm wrench).
3 Unscrew the screw right to the LAN connector.

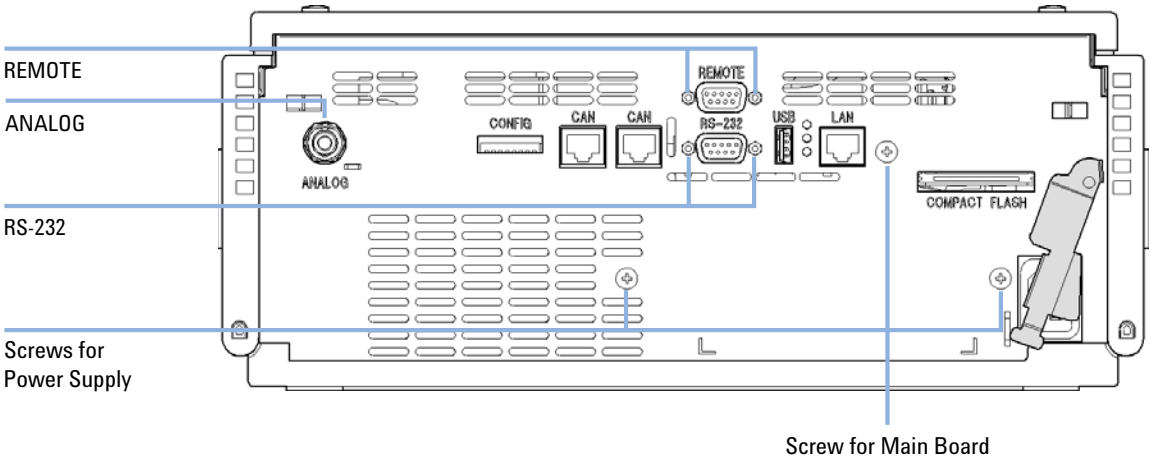
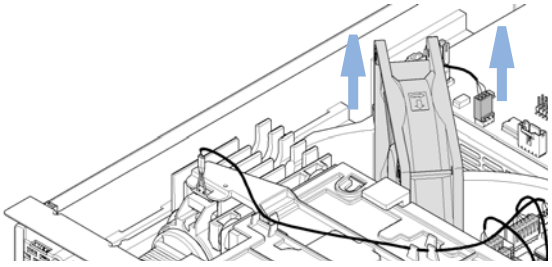
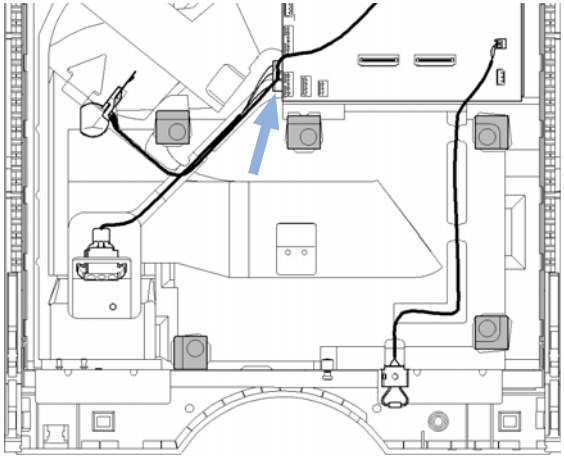


Figure 70 Rear of detector

4 Disconnect and remove the fan.



5 Disconnect the lamp connector from the Main Board (Lamp Power Supply) by pressing the release button at the lower side of the connector.



6 Disconnect the Temperature Sensor from the Main Board (TEMP SENS1).

7 Remove the Main Board by sliding it out of the rear panel.

8 Place the Main Board on an ESD kit.

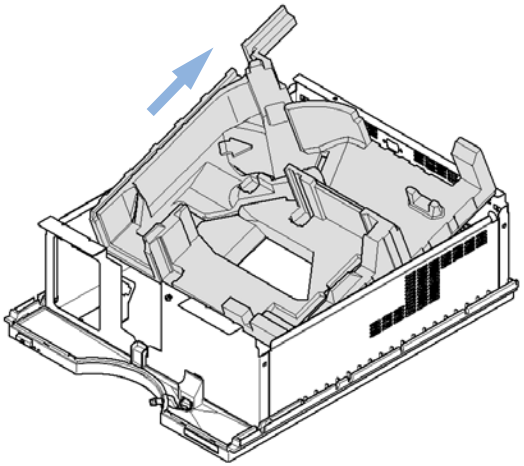
Replacing Main Power Supply/Power Light Pipe

1 Remove the Optical Unit, see "Removing the Optical Unit" on page 201.

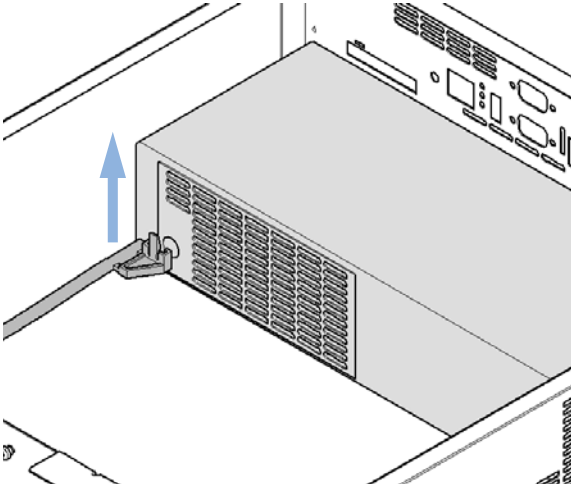
2 Unscrew the two screws that fix the Main Power Supply at the rear panel.

3 Pull the Lamp Cable out of the bottom foam channel.

4 Carefully lift and slide out the bottom foam (not to break the thinner foam areas at the Main Power Supply) until you have access to the power light pipe.



5 Lift the Main Power Supply out of the Powers Light Pipe interface.



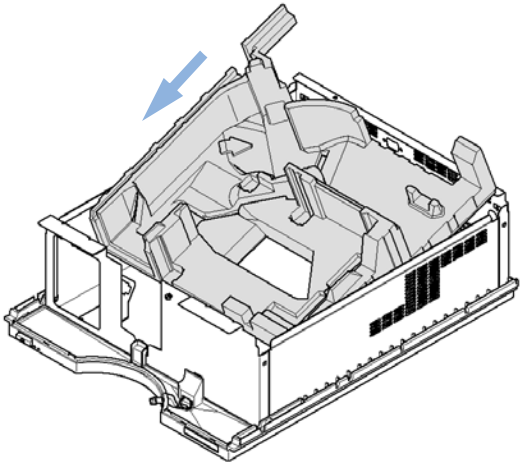
NOTE

At this stage you may replace the Main Power Supply or the Power Light Pipe.

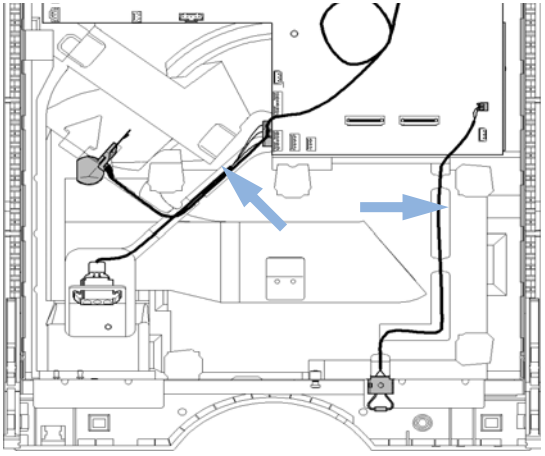
6 Insert the new Main Power Supply and fit the Power Light Pipe interface.

7 Check, that the Power Switch operation is properly working.

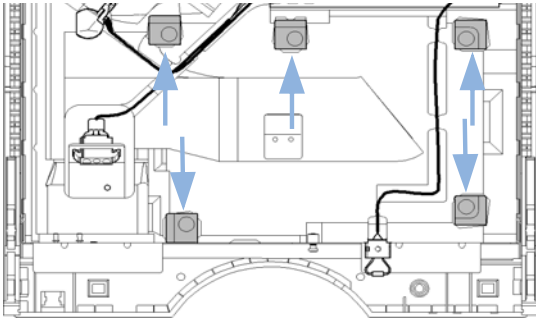
8 Carefully insert the bottom foam (not to break the thinner foam areas) and press it down to the bottom.



9 Fit the Temperature Sensor Cable, the Lamp and Leak Sensor Cable in the bottom foam channel.



10 Assure that the five bumpers for the optical are in place.



Next Steps:

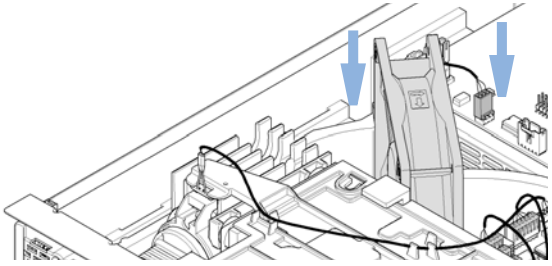
11 Fit the two screws that fix the Main Power Supply at the rear panel.

12 Install the Optical Unit, see "Installing the Optical Unit" on page 204.

Installation of Main Board

NOTE For ESD information refer to "Cautions and Warnings" on page 180.

1. Carefully slide/insert the Main Board into the rear panel.
2. Assure correct positioning within the foam.
3. Refit the nut, spring and washer to the analog output.
4. Refit the nuts to the Remote and RS-232 connector.
5. Reconnect the Temperature Sensor Cable to connector TEMP SENS 1 on main board.
6. Reconnect the lamp connector to the Main Board (Lamp Power Supply).
7. Reconnect the Heater Interface Cable to the Main Board.
8. Reconnect all cables from the Optical Unit to the Main Board.
9. Reinstall the Fan and reconnect it to the Main Board.



Next Steps

1. Replace the Top Foam, see "Removing the Top Cover and Top Foam" on page 182.
2. Replace the metal cover.
3. Replace the Closure and Front Panel.
4. Replace the detector in the system.
5. If a new main board has been installed,
   - enter the serial number as described in "Changing the Type and Serial Number" on page 217.
   - perform a wavelength recalibration as described in "Wavelength Verification/Calibration" on page 128 to enter the calibration parameter in the main board's memory.

Changing the Type and Serial Number

Introduction

When the main board has to be replaced, the new board does not have a serial number. For some modules (e.g. pumps or auto samplers) the type has to be changed (multiple usage boards). Use the information from the serial number plate of your module.

Keep in mind that

- the changes become active after a power cycle of the module.
- the information from the serial number plate of the module is used.
- the exact type (product number) is used.

NOTE If the type (product number) was entered incorrectly, the module may become unusable. Proceed to "Overview" on page 224.

NOTE With firmware A.06.02/B.01.02 and above a wrong type cannot be entered. The entry is checked against the board revision.

Using the Agilent Diagnostic Software

The Agilent Diagnostic Software must be configured in Service Mode to have access to the function **Board Check and Change**.

Close other user interfaces.

1 Start the Diagnostic Software.

2 Select Tools on the left navigation panel.

3 Select in the Tools Selection box **Board Check and Change** and press the button **Start**.

4 Change the field Type and/or Serial as required.

NOTE Some Agilent 1100/1200 series modules require the correct main board version to match the type, for example the SL modules.

5 Press the button **Apply** to complete the action.

A message "The type was changed to XXXXXX. Close this application and switch off and on the changed LC module.

6 Close the Diagnostic Software.

7 Power cycle the module.

8 Restart the User Interface.

Using the Agilent ChemStation

Module serial numbers are entered by typing specific commands on the command line at the bottom of the main user interface screen.

Turn the module on.

Start the Agilent ChemStation.

1 To enter a module serial number, type the following command into the command line:
`print sendmodule$(Lxxx, "ser 'YYNNNNNNNN'")`
or
`print sendmodule$(Nxxx, "ser 'YYNNNNNNNN'")`
where: xxx is the module type, YY is country code (in capital letters) and NNNNNNNN the 8-character serial number of the module in question.

Table 23 ChemStation Command Format - Serial Number Change

Modules with or without optional interface board	Modules with LAN on-board
PRINT SENDMODULE$(Lxxx,"SER 'YYNNNNNNNN'")	PRINT SENDMODULE$(Nxxx,"SER 'YYNNNNNNNN'")
module identifier = L serial number embedded in single-quotes	module identifier = N serial number embedded in single-quotes
PMP, ALS, THM, TCC, VWD, DAD, MWD, FLD, RID	DAD, MWD, VWD

NOTE The first two characters are letters, which should be capitalized.

The reply line will respond with **RA 0000 SER** followed by the module serial number you just entered.

2 To change the type of the module use the following command:
`print sendmodule$(Lxxx, "TYPE 'XXXXX'")`
or
`print sendmodule$(Nxxx, "TYPE 'XXXXX'")`
where: xxx is the module type and XXXXX is the 5-character product number of the module (e.g. G1314B).

Table 24 ChemStation Command Format - Type Change

Modules with or without optional interface board	Modules with LAN on-board
PRINT SENDMODULE$(Lxxx,"TYPE 'XXXXX'")	PRINT SENDMODULE$(Nxxx,"TYPE 'XXXXX'")
module identifier = L product number XXXXX embedded in single-quotes	module identifier = N product number XXXXX embedded in single-quotes
PMP, ALS, THM, TCC, VWD, DAD, MWD, FLD, RID	DAD, MWD, VWD

NOTE Some Agilent 1100/1200 series modules require the correct main board version to match the type, for example the SL modules.

3 Power cycle the module. Then, restart the Agilent ChemStation. If the serial number you have just entered is different than the original module serial number, you will be given the opportunity to edit the configure **1200 access** screen during the restart of the Agilent ChemStation.

4 After restart, the serial number/type you have just entered can be seen under the **Instrument** menu of the main user interface screen.

Using the Instant Pilot G4208A

1 Connect the Instant Pilot to the module. Turn ON the module.

2 On the Instant Pilot's Welcome screen, press **More**, then select **Maintenance**. Using the **up/down arrows**, select the module where you have to change the product number or serial number.

3 Press **PN/SN**. This will display a screen where you can enter the product number and/or serial number.

4 Make your changes, using the information from the product label of your module.

NOTE Some Agilent 1100/1200 series modules require the correct main board version to match the type, for example the SL modules.

5 Press **OK** to highlight the complete command.

6 Press **Done** to transfer the information into the main board's memory. Press **Cancel** to quit the process.

7 Power cycle the module. The Maintenance screen should display the correct serial number for this module.

8 If an other User Interface is also connected, restart the User Interface as well.

Using the Control Module G1323B

1. Connect the control module to the module. Turn ON the module.
2. On the control module, press **System** (**F5**), then **Records** (**F4**). Using the **up/down arrows**, make sure that the module is highlighted.
3. Press **FW Update** (**F5**), then **m.** This will display a box which says **Update Enter Serial#**.
4. Press **Enter**. This will display the box labeled **Serial#**.
5. Letters and numbers are created using the up and down arrows. Into the box labeled Serial#, enter the 10-character serial number for the module. When the 10-character serial number is entered, press **Enter** to highlight the complete serial number. Then, press **Done** (**F6**).
6. Turn the module OFF then ON again. The Records screen should display the correct serial number for this module.
7. If a Agilent ChemStation is also connected, restart the Agilent ChemStation now as well.

NOTE To change the product number go to the *System* screen.

8. Press **Tests** (F3) and select the module and press **Enter**.
9. While in the Tests screen, press **m.m** (m dot m).
10. From the box now displayed, select the *Command*, and press **Enter**.
11. Into the box labeled *Nester* (instruction), enter the command **TYPE 'XXXXXX'** where XXXXXX is embedded in single-quotes.

    Letters and numbers are created using the up and down arrows. XXXXX is the 5-character product number of the module being changed. There must be a space between the word TYPE and the product number.

NOTE Some Agilent 1100/1200 series modules require the correct main board version to match the type, for example the SL modules.

12. Now, press the **Execute** key. Below the box, a reply line should then say:

    Reply RA 0000 TYPE "XXXXX" (XXXXX is what you just entered)

13 Power cycle the module. Turn on should be normal. In the *Records* screen, the product# column should indicate the module you just entered. If an other User Interface is also connected, start it now.

Recover Instructions

Overview

The following situations may come up where the instrument is no longer usable due to

- an incorrect type (product number) entry after the replacement of a main board of the module.
- load of wrong firmware based on the wrong type.

NOTE With firmware A.06.02/B.01.02 and above a wrong type cannot be entered. The entry is checked against the board revision.

The wrong type (product number) could be

- incorrect, but a valid 1100/1200 series module number
- incorrect and invalid 1100/1200 series module number (any name)

Based on above, the User Interfaces react differently.

Table 25 Recover From Wrong Type

User Interface	incorrect but valid type	incorrect but valid type	incorrect and invalid type
Example Conditions	correct type = G1315B entered type = G1314B	correct type = G1315B entered type = G1314B plus wrong firmware from G1314B	correct type = G1315B entered type = G1319B
ChemStation "Recover with Agilent Diagnostic Software (Type & Firmware)" on page 226	shows the incorrect product number Interface shows the settings of the G1314B Type can be changed via command line as described under "Recover with Agilent ChemStation" on page 227	does not show the module NO access to the module is possible Use "Recover with Agilent Diagnostic Software (Type & Firmware)" on page 226	does not show the incorrect product number NO access at all to the module is possible Use "Recover with Agilent Diagnostic Software (Type & Firmware)" on page 226

Table 25 Recover From Wrong Type

User Interface	incorrect but valid type	incorrect but valid type	incorrect and invalid type
Instant Pilot G4208A	comes up with an error access to the module is possible via Service Mode as described under "Recover with Instant Pilot" on page 227	shows resident module G1314B-R NO type change possible Use "Recover with Agilent Diagnostic Software (Type & Firmware)" on page 226	comes up with an error unsupported module G1319B access to the module is possible via Service Mode as described in "Recover with Instant Pilot" on page 227
Control Module G1323	comes up with an error NO access to the module is possible Use "Recover with Agilent Diagnostic Software (Type Only)" on page 226	shows resident or unsupported module NO type change possible Use "Recover with Agilent Diagnostic Software (Type & Firmware)" on page 226	shows resident or unsupported module access to the module is possible via Tests as described in "Recover with Control Module" on page 228
Agilent Diagnostic Software (preferred tool)	shows the incorrect product number access to the module is possible as described in "Recover with Agilent Diagnostic Software (Type Only)" on page 226	shows the incorrect product number access to the module is possible as described in "Recover with Agilent Diagnostic Software (Type Only)" on page 226 If wrong firmware has been loaded in addition, only the LMD Software can revert to correct product number as described in "Recover with Agilent Diagnostic Software (Type & Firmware)" on page 226	shows the incorrect product number access to the module is possible as described in "Recover with Agilent Diagnostic Software (Type Only)" on page 226

Recover with Agilent Diagnostic Software (Type Only)

The Diagnostic Softwares is used in CE mode.

If no LAN connection is possible use RS-232.

The example uses G1315B as correct type.

1 Open a connection to the module (or via system).

   The module will be listed with the wrong product number (type).

2 Select Board Check and Change and press **Start**.

3 In the type field enter G1315B and press **Apply**.

4 Close the Agilent Diagnostic Software.

5 After a power cycle the module should show up with the correct product number (type) in the user interface.

Recover with Agilent Diagnostic Software (Type & Firmware)

Agilent Diagnostic Software in CE mode.

If no LAN connection is possible use RS-232.

The example uses G1315B as correct type.

The module must be configured to *"Stay Resident Mode"* (module boots in resident mode - flashing status LED).

1 Open a connection to the module (or via system).

2 Select Board Check and Change and press **Start**.

3 In the type field enter G1315B and press **Apply**.

4 After a power cycle the module should show up with the correct product number (type) in the user interface.

5 Load the correct main firmware into the module.

6 Turn the module OFF.

7 Set module's configuration switch back to normal mode.

8 Turn on the module.

9 If required, load final firmware into the module.

Recover with Agilent ChemStation

1 Use the ChemStation command line to change to TYPE (product number) as described under “Using the Agilent ChemStation” on page 219.

After power cycle of module the correct TYPE shows up.

Recover with Instant Pilot

USB Flash Drive with file CUSTINST.CMD and a PC with USB interface.

The example uses G1315B as correct type and G1319B as incorrect type.

1 Edit/create the file CUSTINST.CMD and add the following line
`XXXXX|Command from USB 'Type Change'|TYPE 'YYYYYY'`
where XXXXX is for example G1319 from the mis-typed G1319B and YYYYYY is the correct module type, e.g. G1315B.

2 Save and close the file.

3 Insert the USB Flash Drive into the Instant Pilot.

4 From the Welcome screen enter the Service Mode (7268312 or SERVICE).

5 Select the button G1319B (wrong module) and select
`XXXXX|Command from USB 'Type Change'`

6 Press the button **Send**.

This will give as reply:
`RA 0 TYPE "G1315B"`

7 After a power cycle the module should show up with the correct product number (type) in the user interface.

Recover with Control Module

The example uses G1315B as correct type.

1 Select **Tests** - Generic.

2 Press keys **m.m** (m dot m).

This opens hidden functions.

3 Select Command.

4 In the instruction line enter the command
TYPE G1315B

This will give as reply:
RA 0000 TYPE "G1315B"

5 After a power cycle the module should show up with the correct product number (type) in the user interface.

Installing the Foam and the Top Cover

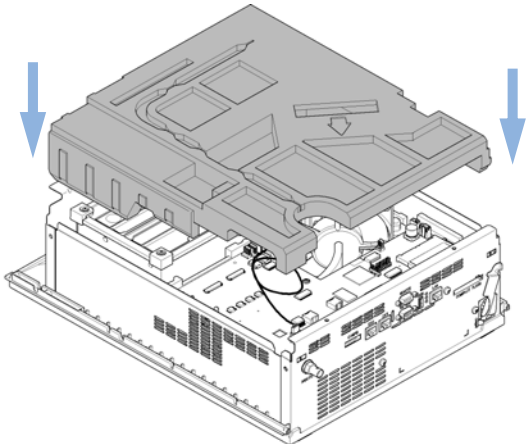
When When all repairs have been completed

Tools required Screwdriver POZI 1 PT3

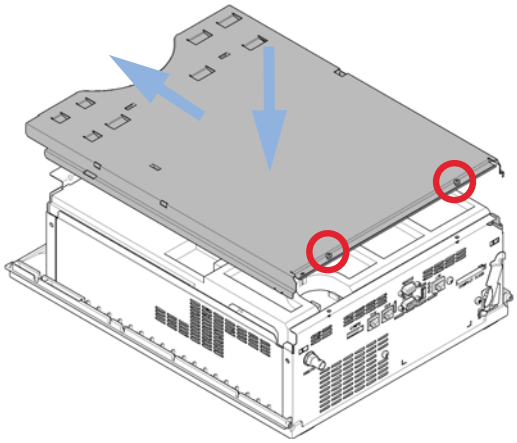
Preparations
- The detector is open and other procedures have been carried out
- All previous repairs have been completed.

NOTE First units have pre-released foam parts. Therefore a single piece of foam is located between optical unit and front sheet metal, right of the flow cell to close the air flow.

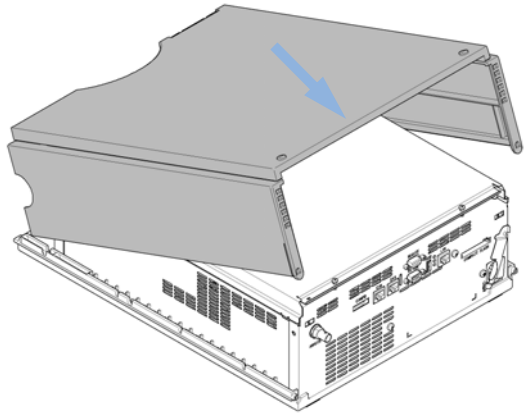
1 Carefully fit the top foam into the detector.



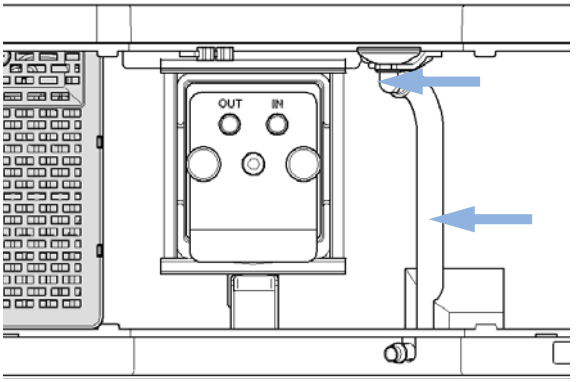
2 Slide the top cover towards the rear and fix the top cover screws.



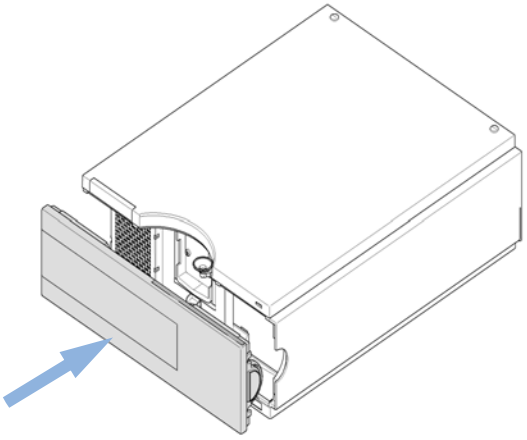
3 Replace the cover.



4 Reinstall the Leak Interface and Leak Funnel.



5 Replace the Front Panel.



6 Replace the detector in the system.

Assembling the Main Cover

When If cover is broken

Tools required None

Parts required

#	Part number	Description
1	5065-9982	Plastics kit (includes base, top, left and right sides)

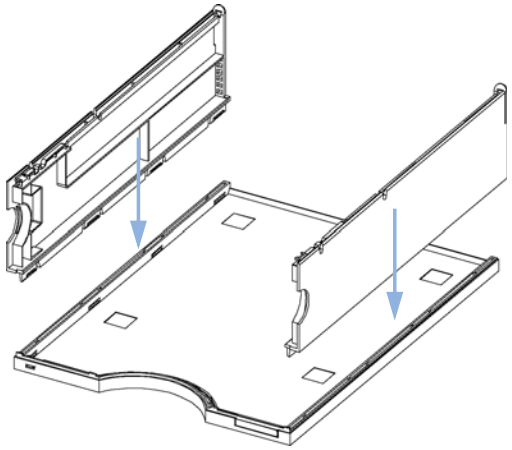
NOTE The plastics kit contains all parts, but it is not assembled.

CAUTION Wrong assembled

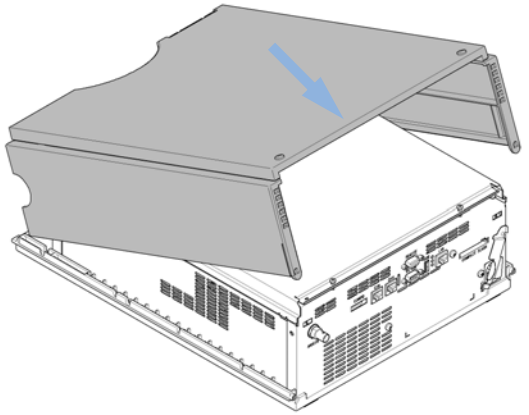
In case you insert the left or right side in the opposite position, you may not be able to remove the side from the top part.

➔ Take care not to mix up left and right side.

1 Place the top part on the bench and insert the left and right side into the top part.



2 Replace the cover.



14
Parts and Materials for Maintenance

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Standard Flow Cell 10 mm / 14 µl 236
Micro Flow Cell 3 mm / 2 µl 238
Semi-micro Flow Cell 6 mm / 5 µl 240
High Pressure Flow Cell 10 mm / 14 µl 242
Cuvette Holder 244
Leak Parts 245

This chapter provides information on parts for maintenance.

Overview of Maintenance Parts

Table 26 Maintenance Parts

Item	Description	Part Number
	Cable CAN assembly 0.5 m	**5181-1516**
	Cable CAN assembly 1 m	**5181-1519**
	Deuterium lamp, with RFID tag	**G1314-60100**
	Deuterium lamp, without RFID tag	**G1314-60100**
	Standard flow cell, with RFID tag, 10 mm 14 µl, additional flow cell parts, see "Standard Flow Cell 10 mm / 14 µl" on page 236	**G1314-60186**
	Micro flow cell, with RFID tag, 3 mm 2 µl, additional flow cell parts, see "Micro Flow Cell 3 mm / 2 µl" on page 238	**G1314-60187**
	Semi-micro flow cell, with RFID tag, 6 mm 5 µl, additional flow cell parts, see "Semi-micro Flow Cell 6 mm / 5 µl" on page 240	**G1314-60183**
	High pressure flow cell, with RFID tag, 10 mm 14 µl, additional flow cell parts, see "High Pressure Flow Cell 10 mm / 14 µl" on page 242	**G1314-60182**
	Cuvette Holder, see "Cuvette Holder" on page 244	**G1314-60200**
	Front cover	**5065-9982**
	Leak handling parts, see "Leak Parts" on page 245	

Accessory Kit

This kit contains some accessories and tools needed for the installation and repair of the detector.

Table 27 Accessory Kit Parts

Description	Part Number
Accessory kit	**G1314-68705**
Corrugated tubing (to waste), re-order 5 m	**5062-2463**
Peek outlet capillary kit, i.d. is 0.25 mm (PEEK)	**5062-8535**
Fitting male PEEK, quantity=1	**0100-1516**
Hex key 1.5 mm	**8710-2393**
Hex key 4 mm	**8710-2392**
Wrench open end 1/4–5/16 inch	**8710-0510**
Wrench open end 4 mm	**8710-1534**

Standard Flow Cell 10 mm / 14 µl

Table 28 Standard Flow Cell Assembly 10 mm / 14 µl with RFID tag

Item	Description	Part Number
	Standard Flow Cell, with RFID tag, 10 mm, 14 µl, 40 bar	**G1314-60186**
	Capillary column – detector PEEK 600 mm lg, 0.17 mm i.d., 1/16 inch o.d.	**5062-8522**
	Cell Repair Kit, includes 2x Gasket #1, 2x Gasket #2, 2x Window Quartz	**G1314-65061**
1	Cell screw kit, quantity=2	**G1314-65062**
2	Conical spring kit, quantity=10	**79853-29100**
3	Ring #1 PEEK kit, quantity=2	**G1314-65065**
4	Gasket #1 (small hole, i.d. 1 mm, o.d. 7.9 mm), KAPTON, quantity=10	**G1314-65063**
5	Window quartz kit, quantity=2	**79853-68742**
6	Gasket #2 (large hole, i.d. 2.4 mm, o.d. 7.9 mm), KAPTON, quantity=10	**G1314-65064**
7	Ring #2 PEEK kit, quantity=2	**G1314-65066**
8	Clip for RFI ID tag	**G1314-44010**
9	Screw for Clip, M2.2 4.5 mm long	**0515-4780**

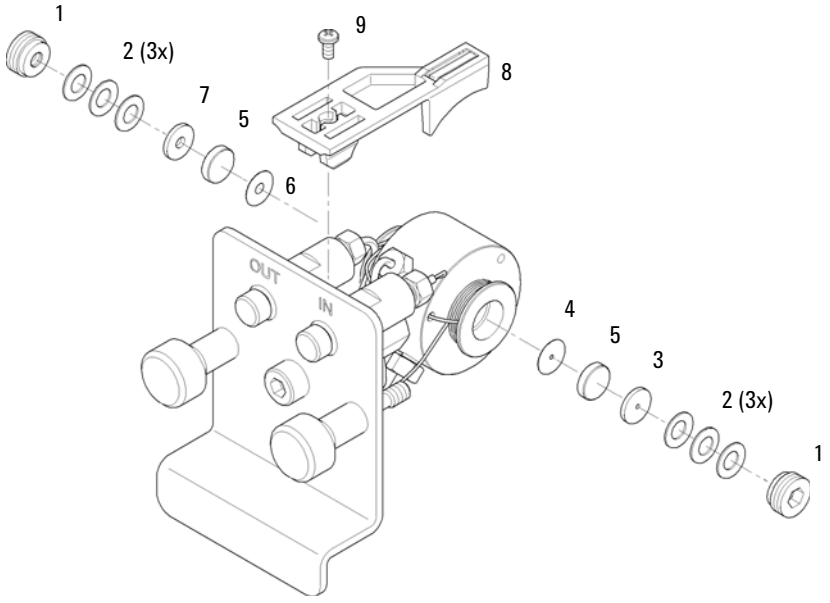


Figure 71 Standard Flow Cell

Micro Flow Cell 3 mm / 2 µl

Table 29 Micro Flow Cell Assembly 3 mm / 2 µl with RFID tag

Item	Description	Part Number
	Micro flow cell, with RFID tag, 3 mm, 2 µl, 120 bar	**G1314-60187**
	Capillary column – detector SST 400 mm lg, 0.12 mm i.d.	**5021-1823**
1	Window screw	**79883-22402**
2	Spring washers, pack of 10	**5062-8553**
3	Compression washer	**79883-28801**
4	Window holder	**79883-22301**
5	Quartz window	**1000-0488**
6	Gasket BACK (round hole 1.8 mm), Teflon, , outlet side	see kits below
7	Gasket FRONT (round hole 1.3 mm), Teflon, inlet side	see kits below
8	Clip for RFI ID tag	**G1314-44010**
9	Screw for Clip, M2.2 4.5 mm long	**0515-4780**
	Capillary IN (0.12 mm, 310 mm lg)	**G1314-87301**
	Capillary OUT (0.17 mm, 120 mm lg)	**G1314-87302**
	Cell repair kit semi-micro, includes window screw kit, 4 mm kexagonal wrench and seal kits	**G1315-68713**
	Seal kit BACK for semi-micro flow cell, qty=12 of item 6	**79883-68702**
	Seal kit FRONT for semi-micro flow cell, qty=12 of item 7	**G1315-68710**
	Window screw kit, includes 2 quartz windows, 2 compression washers, 2 window holders, 2 window screws and 10 spring washers	**79883-68703**

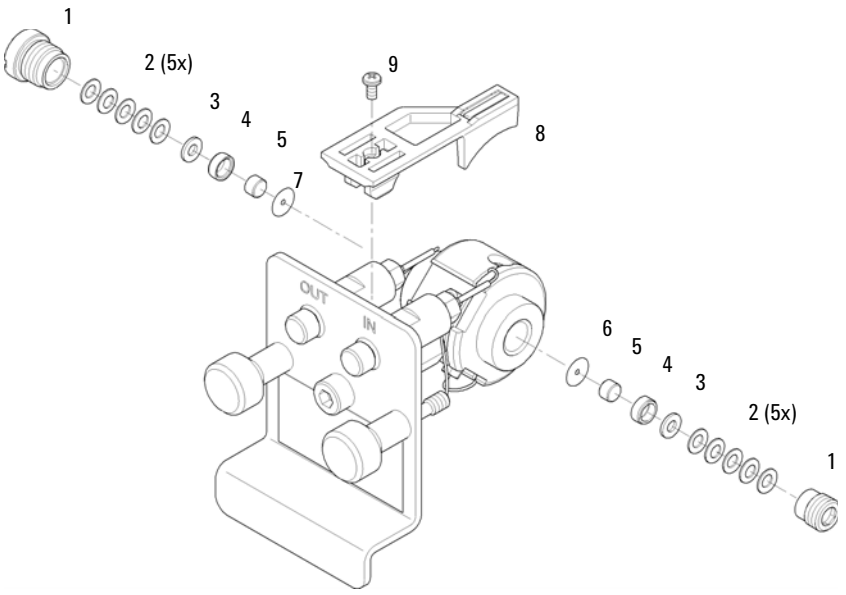


Figure 72 Micro Flow Cell

Semi-micro Flow Cell 6 mm / 5 µl

Table 30 Semi-micro Flow Cell Assembly 6 mm / 5 µl with RFID tag

Item	Description	Part Number
	Semi-micro flow cell assembly, with RFID tag, 6 mm, 5 µl, 40 bar	**G1314-60183**
1	Cell screw	**79853-27200**
	Semi-micro cell kit, consisting of: two windows, two #1 standard gaskets, one #1 semi-micro gasket and one #2 semi-micro gasket.	**G1314-65056**
2	Conical springs, (pack of 10)	**79853-29100**
3	Ring SST, (pack of 2)	**79853-22500**
4	PTFE #1 standard gasket (round hole i.d. 2.5 mm, o.d. 8 mm), (pack of 10)	**79853-68743**
5	Quartz window, (pack of 2)	**79853-68742**
6	Semi-micro #1 gasket (long hole 1.5 x 3.5 mm), PTFE	
7	Semi-micro #2 gasket (long hole 2 x 4 mm), PTFE	
	Inlet capillary, 400 mm long, 0.12 mm i.d.	**5021-1823**
8	Clip for RFID tag	**G1314-44010**
9	Screw for Clip, M2.2 4.5 mm long	**0515-4780**

NOTE The semi-micro #1 and #2 gaskets (items 6 and 7) look very similar. Do not mix them up.

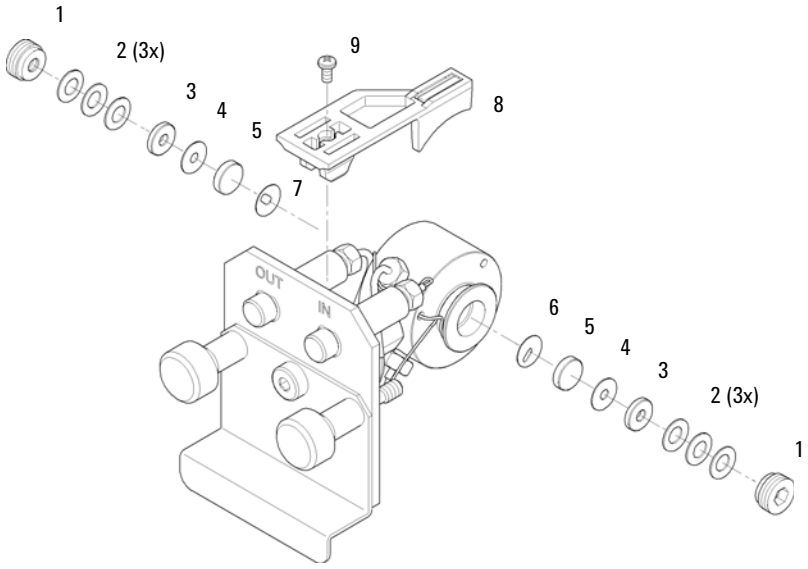


Figure 73 Semi-micro Flow Cell

High Pressure Flow Cell 10 mm / 14 µl

Table 31 High Pressure Flow Cell Assembly 10 mm, 14 µl with RFID tag

Item	Description	Part Number
	High pressure flow cell, with RFID tag, 10 mm, 14 µl, 400 bar	**G1314-60182**
	Capillary column–detector SST 380 mm lg, 0.17 i.d. (one side not assembled)	**G1315-87311**
1	Cell screw	**79853-27200**
	Cell kit Agilent, comprises: two windows, two KAPTON gaskets and two PEEK rings	**G1314-65054**
2	Ring PEEK kit, quantity=2	**79853-68739**
3	Window quartz kit, quantity=2	**79853-68734**
4	Gasket kit, KAPTON, quantity=10	**G1314-65055**
5	Clip for RFI ID tag	**G1314-44010**
6	Screw for Clip, M2.2 4.5 mm long	**0515-4780**

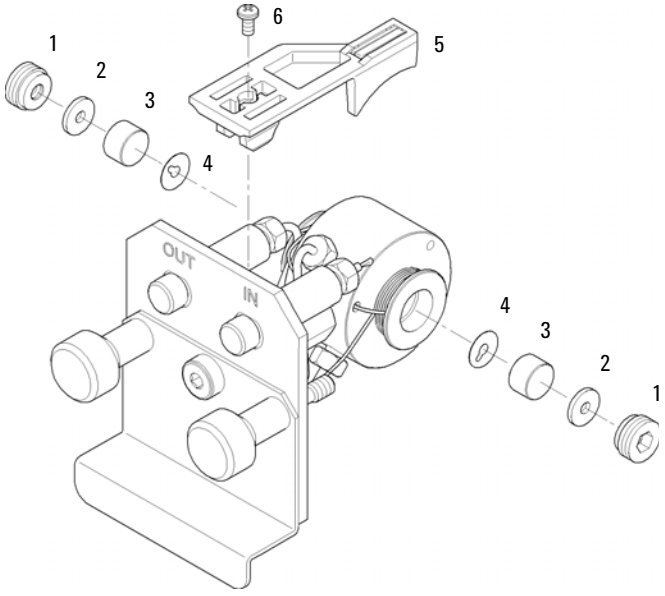


Figure 74 High Pressure Flow Cell

Cuvette Holder

Table 32 Cuvette Holder

Item	Description	Part Number
	Cuvette Holder	**G1314-60200**

For information the use of the cuvette holder, refer to "Using the Cuvette Holder" on page 173.

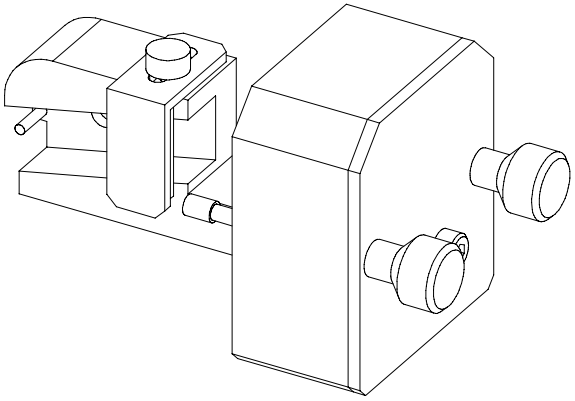


Figure 75 Cuvette Holder

Leak Parts

Table 33 Leak Parts

Item	Description	Part Number
3	Leak funnel	**5041-8388**
4	Leak funnel holder	**5041-8389**
5	Clip	**5041-8387**
6	Corrugated tubing, 120 mm lg, re-order 5 m	**5062-2463**
7	Corrugated tubing, 1200 mm lg, re-order 5 m	**5062-2463**

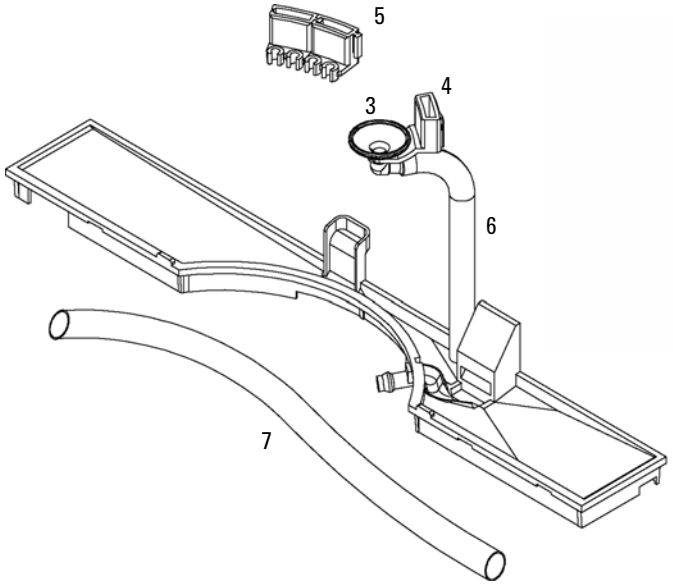


Figure 76 Leak Parts

15
Parts for Repairs

Overview of Main Assemblies 248
Optical Unit 250
Heater and Fan 252
Sheet Metal Kit 254
Plastic Parts 255
Leak Parts 256
Foam Parts 257
Power and Status Light Pipes 258

This chapter provides information on parts for repair.

Overview of Main Assemblies

Table 34 Main Assemblies

Item	Description	Part Number
1	Main board VWM for G1314D VWD	**G1314-65070**
1	Main board VWM for G1314D VWD (exchange part)	**G1314-69070**
1	Main board VWM for G1314E VWD SL Plus	**G1314-65080**
1	Main board VWM for G1314E VWD SL Plus (exchange part)	**G1314-69080**
	Cable CAN assembly	**5181-1516**
	Hexagonal nut for RS-232C connector	**1251-7788**
	Nut for analog connector	**2940-0256**
	Washer for analog connector	**2190-0699**
2	Power supply assembly, additional power and status light parts, see"Power and Status Light Pipes" on page 258	**0950-2528**
3	Optical unit, additional optical unit parts, see "Optical Unit" on page 250	**G1314-60062**
3	Optical unit (exchange part)	**G1314-69062**
4	Fan assembly	**G1314-65004**
5	Deuterium lamp, with RFID tag	**G1314-60101**
6	Heater Assembly	**G1314-60113**
7	Standard Flow cell, see "Standard Flow Cell 10 mm / 14 µl" on page 236 Micro Flow Cell, see "Micro Flow Cell 3 mm / 2 µl" on page 238 Semi-Micro Flow Cell, see "Semi-micro Flow Cell 6 mm / 5 µl" on page 240 High Pressure Flow Cell, see "High Pressure Flow Cell 10 mm / 14 µl" on page 242	**G1314-60186** **G1314-60187** **G1314-60183** **G1314-60182**
	Leak handling parts, see "Leak Parts" on page 256	
9	Leak sensor assembly	**5061-3356**

Table 34 Main Assemblies

Item	Description	Part Number
10	Heater Interface and Cable, see "Heater and Fan" on page 252	
	Temp Sensor Assembly (includes board and cable), loacted in the top foam, see "Heater and Fan" on page 252	
	Plastic parts (housing), see"Plastic Parts" on page 255	
	Sheet metal parts, see"Sheet Metal Kit" on page 254	
	Foam parts, see "Foam Parts" on page 257	G1314-60009
	Power and status light parts, see "Power and Status Light Pipes" on page 258	

Optical Unit

NOTE Repairs in the optical unit are not possible due to critical alignments. In case of problems, the complete optical unit has to be replaced.

Table 35 Optical Unit

Item	Description	Part Number
1	Optical unit with lamp	**G1314-60062**
1	Optical unit (exchange part) without lamp	**G1314-69062**
2	Deuterium lamp, with RFID tag	**G1314-60101**
3	Cable Lamp - Power Supply	**G1314-60110**
4	Flow Cell	
5	Screw Kit Optical Unit, includes 4 each Screw Optical Cover Spring Washer	**G1314-67002**
6	ID Tag Reader Cell	**G1315-60009**
7	ID Tag Reader Lamp	**G1315-60009**
8	Cover Optical	**G1315-60009**
9	Damper Kit Optical Unit	**G1314-67001**

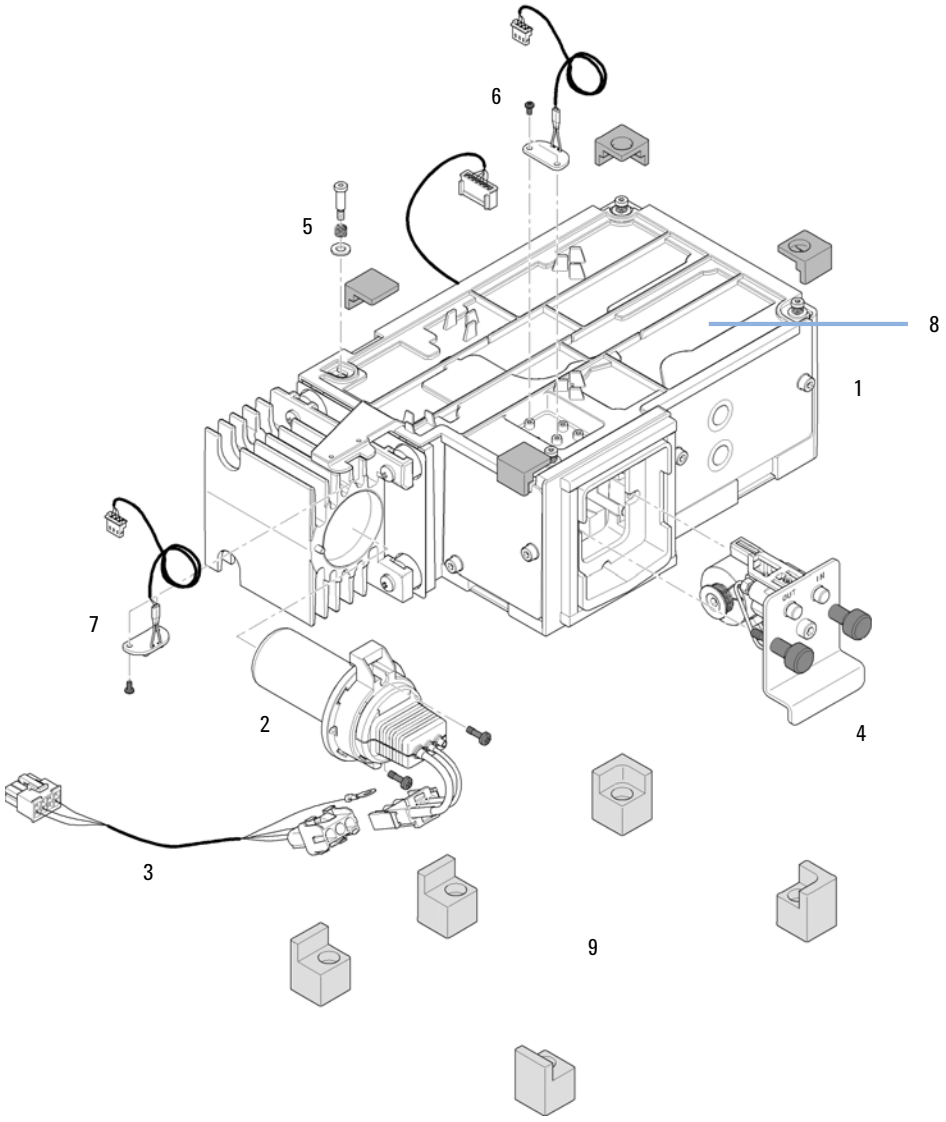


Figure 77 Optical Unit

Heater and Fan

Table 36 Heater and Fan

Item	Description	Part Number
1	Fan assembly	**3160-1016**
2	Heater Assembly	**G1314-60114**
3	Heater Interface Board Kit (includes Heater Board and 4 rivets)	**G1314-67000**
4	Heater Cable	**G1314-81010**
5	Holder Temp Sensor	**G1314-44016**
6	Temp Sensor Board	**G1314-65802**
7	Temp Sensor Cable	**G4280-81620**

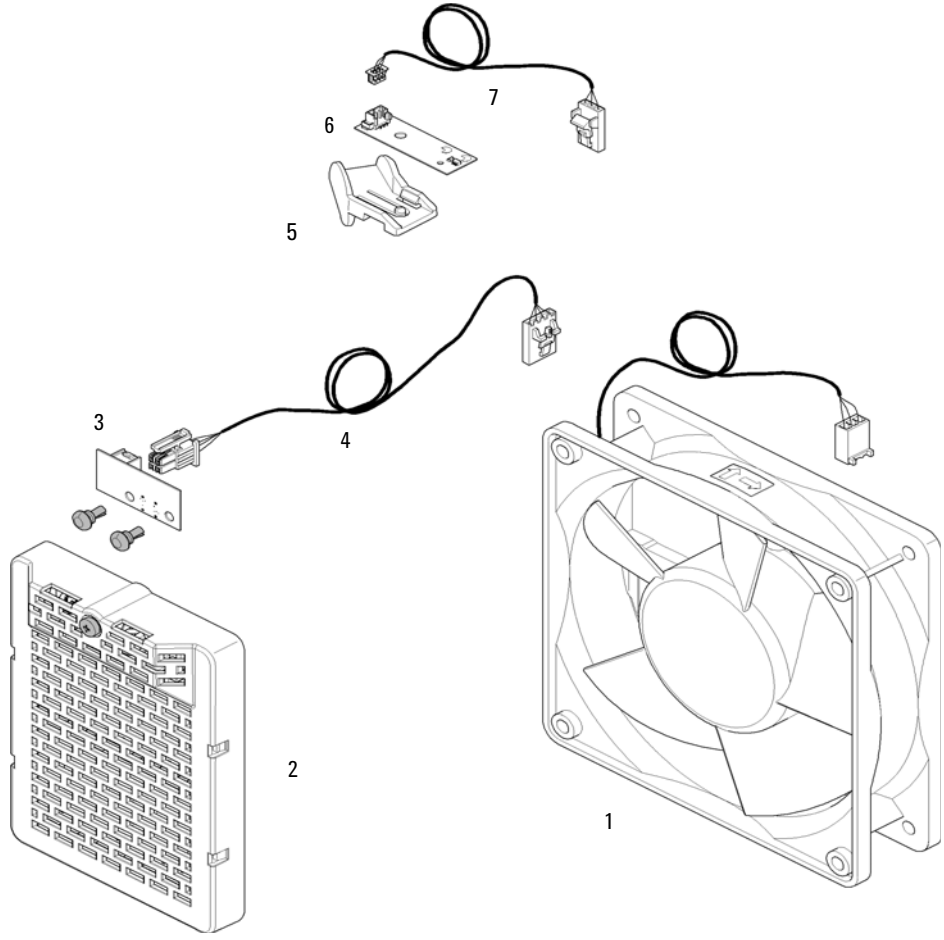


Figure 78 Heater and Fan

Sheet Metal Kit

Table 37 Sheet Metal Kit Parts

Item	Description	Part Number
	Sheet metal kit includes items 1, 2, 3 and 4 (1x)	**G1314-68000**
1	Top cover	
2	Case	
3	Plate	
4	Screws M3 for cover and plate	**5022-2112**

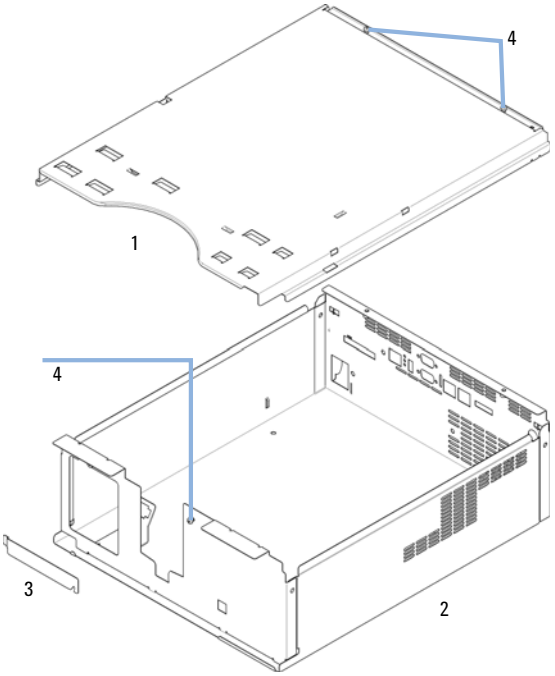


Figure 79 Sheet Metal Kit

Plastic Parts

Table 38 Plastics Parts

Item	Description	Part Number
1	Front cover	**5065-9982**
2	Plastics, includes base, sides and top	**5065-9985**
3	Name plate Agilent 1200 Series	**5042-8901**

NOTE For correct assembling of the top and sides, see "Assembling the Main Cover" on page 231.

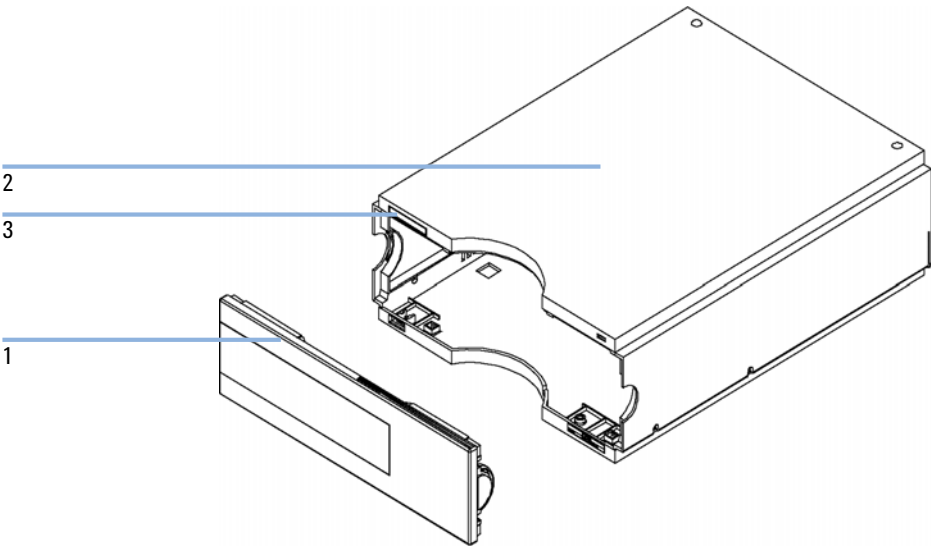


Figure 80 Plastic Parts

Leak Parts

Table 39 Leak Parts

Item	Description	Part Number
1	Leak sensor assembly	**5061-3356**
2	Leak pan	**5042-8908**
3	Leak funnel	**5041-8388**
4	Leak funnel holder	**5041-8389**
5	Clip	**5041-8387**
6	Corrugated tubing, 120 mm lg, re-order 5 m	**5062-2463**
7	Corrugated tubing, 1200 mm lg, re-order 5 m	**5062-2463**

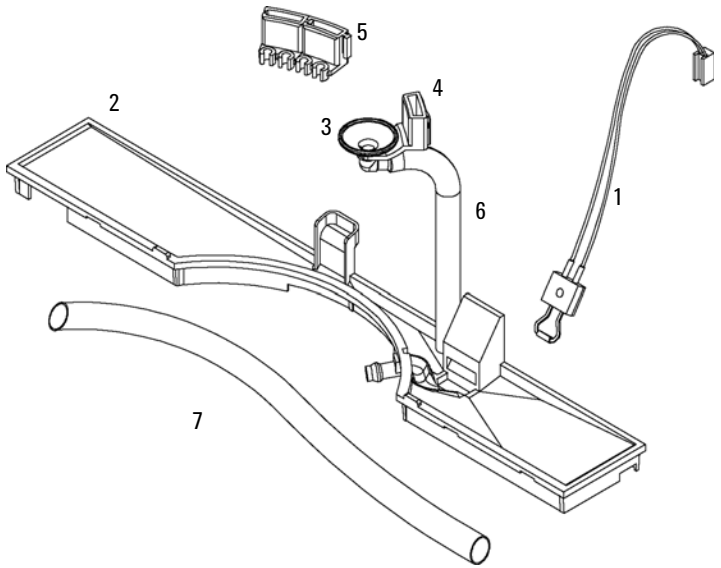


Figure 81 Leak Parts

Foam Parts

Table 40 Foam Parts

Item	Description	Part Number
1, 2	EPP foam kit, includes Base and top (part #1 and #2)	**G1314-60009**
3	Damper kit (includes bumpers for optical and fan)	**G1314-67001**

NOTE Do not order the individual part numbers mentioned on the foam.

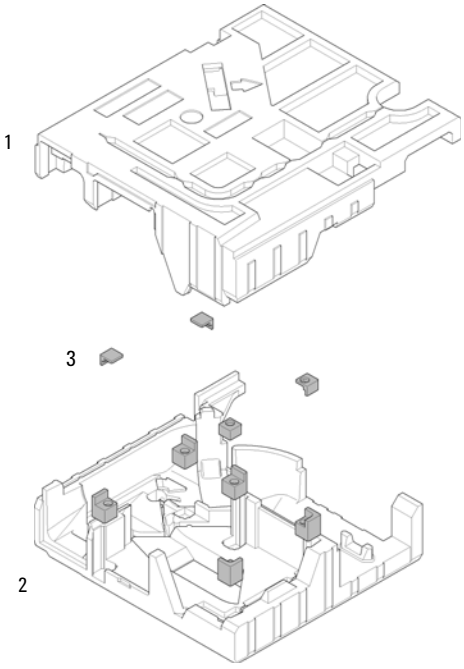


Figure 82 Foam Parts

Power and Status Light Pipes

Table 41 Power and Status Light Pipes

Item	Description	Part Number
	Power supply assembly	**0950-2528**
	Screw M4 × 0.7, 8 mm lg, to fix power supply at rear panel	**0515-0910**
	Washer	**2190-0409**
1	Power light pipe	**5041-8382**
2	Status light pipe	**5041-8384**
3	Power switch button	**5041-8381**
4	Coupler for power supply actuator	**5041-8383**

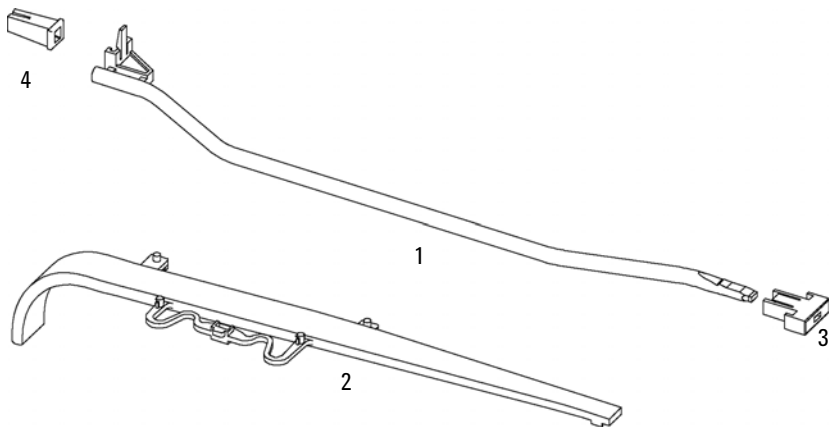


Figure 83 Power and Status Light Pipe

16
Identifying Cables

Cable Overview 260
Analog Cables 262
Remote Cables 265
BCD Cables 270
External Contact Cables 272
CAN/LAN Cables 273
Auxiliary Cables 274
RS-232 Cables 275

This chapter provides information on cables used with the 1200 series of HPLC modules.

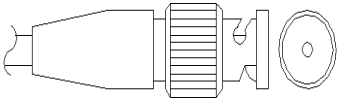
Cable Overview

NOTE Never use cables other than the ones supplied by Agilent Technologies to ensure proper functionality and compliance with safety or EMC regulations.

Type	Description	Part Number
Analog cables	3390/2/3 integrators	**01040-60101**
	3394/6 integrators	**35900-60750**
	Agilent **35900A** A/D converter	**35900-60750**
	General purpose (spade lugs)	**01046-60105**
Remote cables	3390 integrator	**01046-60203**
	3392/3 integrators	**01046-60206**
	3394 integrator	**01046-60210**
	3396A (Series I) integrator	**03394-60600**
	3396 Series II / 3395A integrator, see details in section "Remote Cables" on page 265	
	3396 Series III / 3395B integrator	**03396-61010**
	HP 1050 modules / HP 1046A FLD	**5061-3378**
	HP 1046A FLD	**5061-3378**
	Agilent **35900A** A/D converter	**5061-3378**
	HP 1040 diode-array detector	**01046-60202**
	HP 1090 liquid chromatographs	**01046-60202**
	Signal distribution module	**01046-60202**
BCD cables	3396 integrator	**03396-60560**
	General purpose (spade Lugs)	**G1351-81600**
Auxiliary	Agilent 1100 Series vacuum degasser	**G1322-61600**

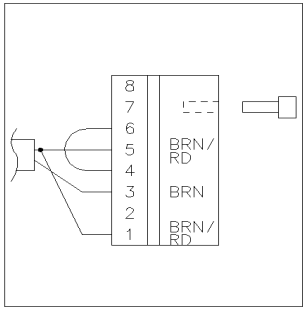
Type	Description	Part Number
CAN cables	Agilent 1100/1200 module to module,0.5m lg Agilent 1100/1200 module to module, 1m lg	**5181-1516** **5181-1519**
External contacts	Agilent 1100/1200 Series interface board to general purpose	**G1103-61611**
GPIB cable	Agilent 1100/1200 module to ChemStation, 1 m Agilent 1100/1200 module to ChemStation, 2 m	**10833A** **10833B**
RS-232 cable	Agilent 1100/1200 module to a computer This kit contains a 9-pin female to 9-pin female Null Modem (printer) cable and one adapter.	**34398A**
LAN cable	Twisted pair cross over LAN cable, (shielded 3m long) (for point to point connection)	**5023-0203**
	Twisted pair cross over LAN cable, (shielded 7m long) (for point to point connection)	**5023-0202**

Analog Cables

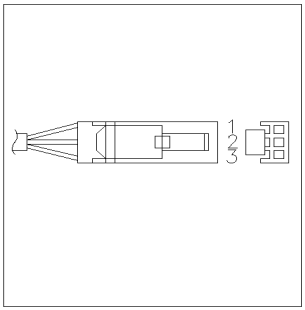


One end of these cables provides a BNC connector to be connected to Agilent 1100/1200 Series modules. The other end depends on the instrument to which connection is being made.

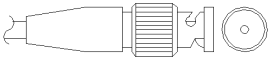
Agilent 1100/1200 to 3390/2/3 Integrators

Connector01040-60101	Pin 3390/2/3	Pin Agilent 1100/1200	Signal Name
	1	Shield	Ground
	2		Not connected
	3	Center	Signal +
	4		Connected to pin 6
	5	Shield	Analog -
	6		Connected to pin 4
	7		Key
	8		Not connected

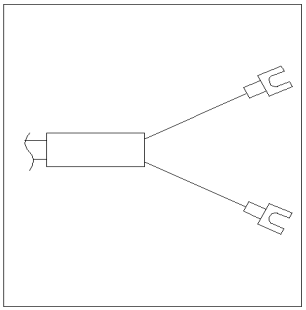
Agilent 1100/1200 to 3394/6 Integrators

Connector35900-60750	Pin 3394/6	Pin Agilent 1100/1200	Signal Name
	1		Not connected
	2	Shield	Analog -
	3	Center	Analog +

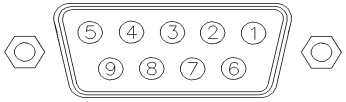
Agilent 1100/1200 to BNC Connector

Connector8120-1840	Pin BNC	Pin Agilent 1100/1200	Signal Name
	Shield	Shield	Analog -
	Center	Center	Analog +

Agilent 1100/1200 to General Purpose

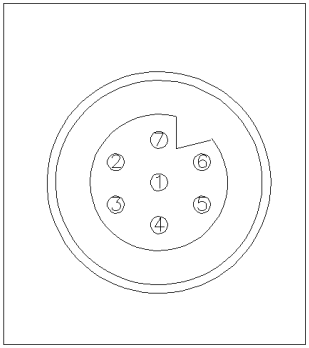
Connector01046-60105	Pin 3394/6	Pin Agilent 1100/1200	Signal Name
	1		Not connected
	2	Black	Analog -
	3	Red	Analog +

Remote Cables

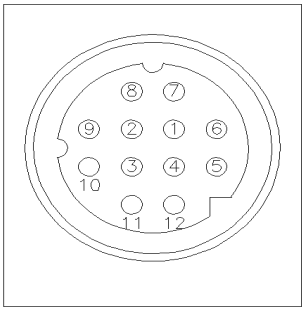


One end of these cables provides a Agilent Technologies APG (Analytical Products Group) remote connector to be connected to Agilent 1100/1200 Series modules. The other end depends on the instrument to be connected to.

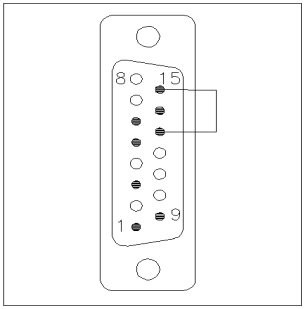
Agilent 1100/1200 to 3390 Integrators

Connector01046-60203	Pin 3390	Pin Agilent 1100/1200	Signal Name	Active (TTL)
	2	1 - White	Digital ground	
	NC	2 - Brown	Prepare run	Low
	7	3 - Gray	Start	Low
	NC	4 - Blue	Shut down	Low
	NC	5 - Pink	Not connected	
	NC	6 - Yellow	Power on	High
	NC	7 - Red	Ready	High
	NC	8 - Green	Stop	Low
	NC	9 - Black	Start request	Low

Agilent 1100/1200 to 3392/3 Integrators

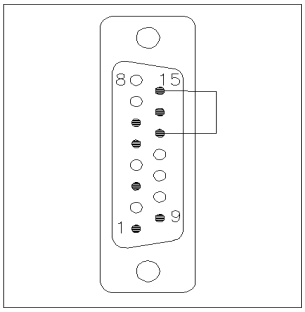
Connector01046-60206	Pin 3392/3	Pin Agilent 1100/1200	Signal Name	Active (TTL)
	3	1 - White	Digital ground	
	NC	2 - Brown	Prepare run	Low
	11	3 - Gray	Start	Low
	NC	4 - Blue	Shut down	Low
	NC	5 - Pink	Not connected	
	NC	6 - Yellow	Power on	High
	9	7 - Red	Ready	High
	1	8 - Green	Stop	Low
	NC	9 - Black	Start request	Low

Agilent 1100/1200 to 3394 Integrators

Connector01046-60210	Pin 3394	Pin Agilent 1100/1200	Signal Name	Active (TTL)
	9	1 - White	Digital ground	
	NC	2 - Brown	Prepare run	Low
	3	3 - Gray	Start	Low
	NC	4 - Blue	Shut down	Low
	NC	5 - Pink	Not connected	
	NC	6 - Yellow	Power on	High
	5,14	7 - Red	Ready	High
	6	8 - Green	Stop	Low
	1	9 - Black	Start request	Low
	13, 15		Not connected	

NOTE START and STOP are connected via diodes to pin 3 of the 3394 connector.

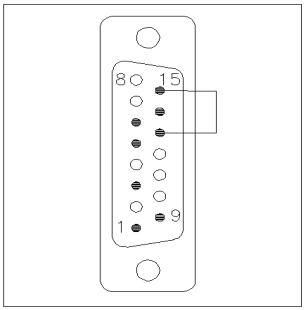
Agilent 1100/1200 to 3396A Integrators

Connector03394-60600	Pin 3394	Pin Agilent 1100/1200	Signal Name	Active (TTL)
	9	1 - White	Digital ground	
	NC	2 - Brown	Prepare run	Low
	3	3 - Gray	Start	Low
	NC	4 - Blue	Shut down	Low
	NC	5 - Pink	Not connected	
	NC	6 - Yellow	Power on	High
	5,14	7 - Red	Ready	High
	1	8 - Green	Stop	Low
	NC	9 - Black	Start request	Low
	13, 15		Not connected	

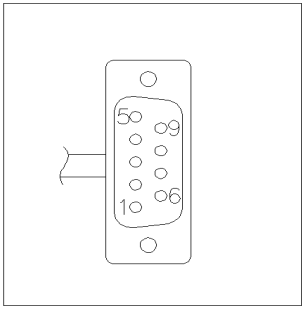
Agilent 1100/1200 to 3396 Series II / 3395A Integrators

Use the cable **part number: 03394-60600** and cut pin #5 on the integrator side. Otherwise the integrator prints START; not ready.

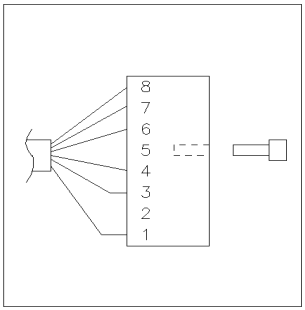
Agilent 1100/1200 to 3396 Series III / 3395B Integrators

Connector03396-61010	Pin 33XX	Pin Agilent 1100/1200	Signal Name	Active (TTL)
	9	1 - White	Digital ground	
	NC	2 - Brown	Prepare run	Low
	3	3 - Gray	Start	Low
	NC	4 - Blue	Shut down	Low
	NC	5 - Pink	Not connected	
	NC	6 - Yellow	Power on	High
	14	7 - Red	Ready	High
	4	8 - Green	Stop	Low
	NC	9 - Black	Start request	Low
	13, 15		Not connected	

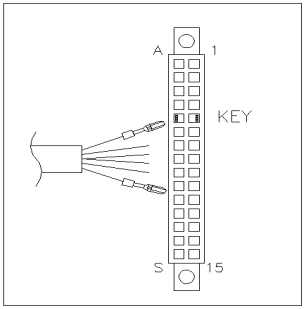
Agilent 1100/1200 to HP 1050, HP 1046A or Agilent 35900 A/D Converters

Connector5061-3378	Pin HP 1050/....	Pin Agilent 1100/1200	Signal Name	Active (TTL)
	1 - White	1 - White	Digital ground	
	2 - Brown	2 - Brown	Prepare run	Low
	3 - Gray	3 - Gray	Start	Low
	4 - Blue	4 - Blue	Shut down	Low
	5 - Pink	5 - Pink	Not connected	
	6 - Yellow	6 - Yellow	Power on	High
	7 - Red	7 - Red	Ready	High
	8 - Green	8 - Green	Stop	Low
	9 - Black	9 - Black	Start request	Low

Agilent 1100/1200 to HP 1090 LC or Signal Distribution Module

Connector01046-60202	Pin HP 1090	Pin Agilent 1100/1200	Signal Name	Active (TTL)
	1	1 - White	Digital ground	
	NC	2 - Brown	Prepare run	Low
	4	3 - Gray	Start	Low
	7	4 - Blue	Shut down	Low
	8	5 - Pink	Not connected	
	NC	6 - Yellow	Power on	High
	3	7 - Red	Ready	High
	6	8 - Green	Stop	Low
	NC	9 - Black	Start request	Low

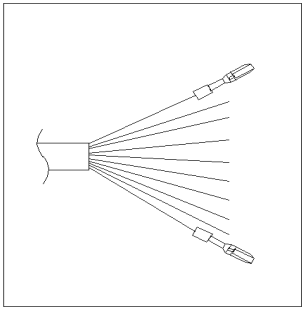
Agilent 1100/1200 to General Purpose

Connector01046-60201	Pin Universal	Pin Agilent 1100/1200	Signal Name	Active (TTL)
		1 - White	Digital ground	
		2 - Brown	Prepare run	Low
		3 - Gray	Start	Low
		4 - Blue	Shut down	Low
		5 - Pink	Not connected	
		6 - Yellow	Power on	High
		7 - Red	Ready	High
		8 - Green	Stop	Low
		9 - Black	Start request	Low

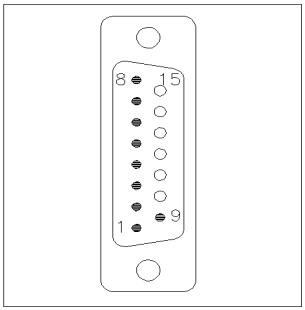
BCD Cables

One end of these cables provides a 15-pin BCD connector to be connected to the Agilent 1200 Series modules. The other end depends on the instrument to be connected to

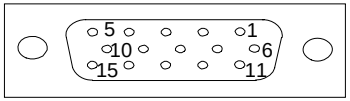
Agilent 1200 to General Purpose

ConnectorG1351-81600	Wire Color	Pin Agilent 1200	Signal Name	BCD Digit
	Green	1	BCD 5	20
	Violet	2	BCD 7	80
	Blue	3	BCD 6	40
	Yellow	4	BCD 4	10
	Black	5	BCD 0	1
	Orange	6	BCD 3	8
	Red	7	BCD 2	4
	Brown	8	BCD 1	2
	Gray	9	Digital ground	Gray
	Gray/pink	10	BCD 11	800
	Red/blue	11	BCD 10	400
	White/green	12	BCD 9	200
	Brown/green	13	BCD 8	100
	not connected	14		
	not connected	15	+ 5 V	Low

Agilent 1200 to 3396 Integrators

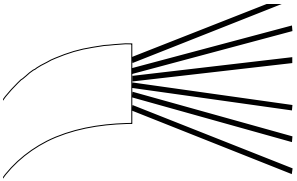
Connector03396-60560	Pin 3392/3	Pin Agilent 1200	Signal Name	BCD Digit
	1	1	BCD 5	20
	2	2	BCD 7	80
	3	3	BCD 6	40
	4	4	BCD 4	10
	5	5	BCD0	1
	6	6	BCD 3	8
	7	7	BCD 2	4
	8	8	BCD 1	2
	9	9	Digital ground	
	NC	15	+ 5 V	Low

External Contact Cables

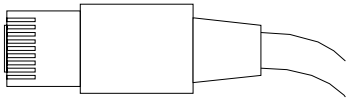


One end of this cable provides a 15-pin plug to be connected to Agilent 1200 Series module's interface board. The other end is for general purpose.

Agilent 1200 Series Interface Board to general purposes

ConnectorG1103-61611	Color	Pin Agilent 1200	Signal Name
	White	1	EXT 1
	Brown	2	EXT 1
	Green	3	EXT 2
	Yellow	4	EXT 2
	Grey	5	EXT 3
	Pink	6	EXT 3
	Blue	7	EXT 4
	Red	8	EXT 4
	Black	9	Not connected
	Violet	10	Not connected
	Grey/pink	11	Not connected
	Red/blue	12	Not connected
	White/green	13	Not connected
	Brown/green	14	Not connected
	White/yellow	15	Not connected

CAN/LAN Cables



Both ends of this cable provide a modular plug to be connected to Agilent 1200 Series module's CAN or LAN connectors.

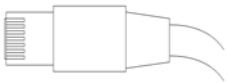
CAN Cables

Agilent 1200 module to module, 0.5 m	**5181-1516**
Agilent 1200 module to module, 1 m	**5181-1519**
Agilent 1200 module to control module	**G1323-81600**

LAN Cables

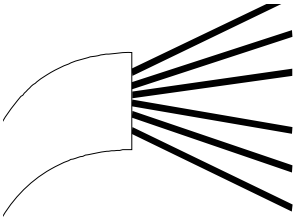
Description	Part number
Cross-over network cable (shielded, 3 m long), (for point to point connection)	**5023-0203**
Twisted pair network cable (shielded, 7 m long) (for hub connections)	**5023-0202**

Auxiliary Cables



One end of this cable provides a modular plug to be connected to the Agilent 1100 Series vacuum degasser. The other end is for general purpose.

Agilent 1100 Series Degasser to general purposes

ConnectorG1322-81600	Color	Pin Agilent 1100	Signal Name
	White	1	Ground
	Brown	2	Pressure signal
	Green	3	
	Yellow	4	
	Grey	5	DC + 5 V IN
	Pink	6	Vent

RS-232 Cables

Description	Part number
RS-232 cable, instrument to PC, 9-to-9 pin (female) This cable has special pin-out, and is not compatible with connecting printers and plotters.	**24542U** **G1530-60600**
RS-232 cable kit, 9-to-9 pin (female) and one adapter 9-pin (male) 25-pin female. Suited for instrument to PC.	**34398A**
Cable Printer Serial & Parallel, is a SUB-D 9 pin female vs. Centronics connector on the other end (NOT FOR FW UPDATE).	**5181-1529**
This kit contains a 9-pin female to 9-pin female Null Modem (printer) cable and one adapter. Use the cable and adapter to connect Agilent Technologies instruments with 9-pin male RS-232 connectors to most PCs or printers.	**34398A**

17
Hardware Information

Optical System Components 278
Detector Main Board 279
Firmware Description 285
Agilent 1100/1200 Series Interfaces 287
Setting the 8-bit Configuration Switch 293
Main Power Supply Assembly (Standard) 297

This chapter describes the detector in more detail on hardware and electronics.

Optical System Components

The figure below shows the main components of the optical unit. For details refer to “Optical System Overview” on page 12

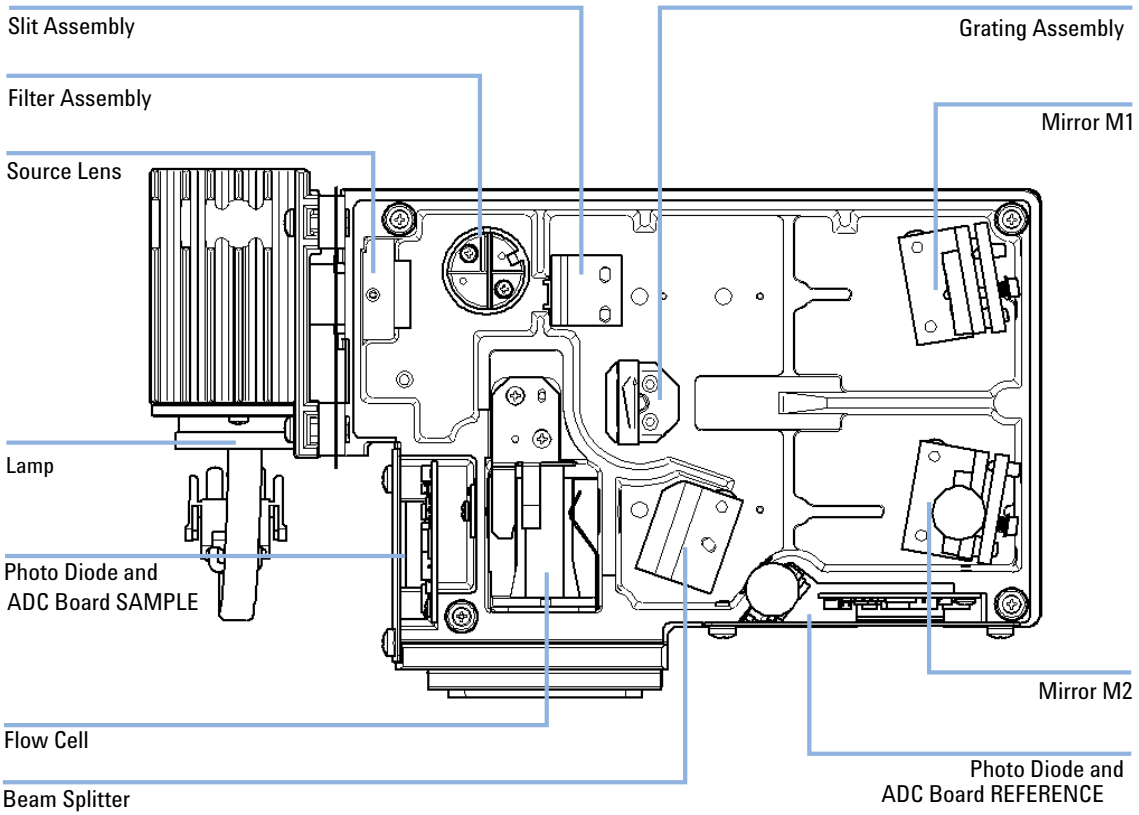


Figure 84 Optical System

Detector Main Board

This board controls all information and activities of all assemblies within the detector module. The operator enters parameters, changes modes and controls the module, through interfaces (CAN, LAN or RS-232C), connected to the user interfaces.

Depending on the version of the detector there are two main boards available:

G1314D VWD	Main board G1314-65070	requires firmware B.06.20 or above
G1314E VWD-SL Plus	Main board G1314-65080	high data rates, requires firmware B.06.20 or above

Main Features

- lamp supply for UV-lamp,
- LAN on-board,
- CAN for internal 1200 interfacing,
- RS-232 for third part control or service,
- 1 analog output (0 - 1 V or 0 - 100 mV full scale),
- leak sensing (flow cell),
- safety switch turns off high voltages/fan,
- CompactFlash card slot for data recovery (G1314E only),
- identification tag operation for flow cell and UV-lamp,
- temperature control for optical unit for stable baseline,
- USB for future use,
- no individual battery.

Functional Diagram of Main Board

The schematic below shows the functional diagram of the detector electronics.

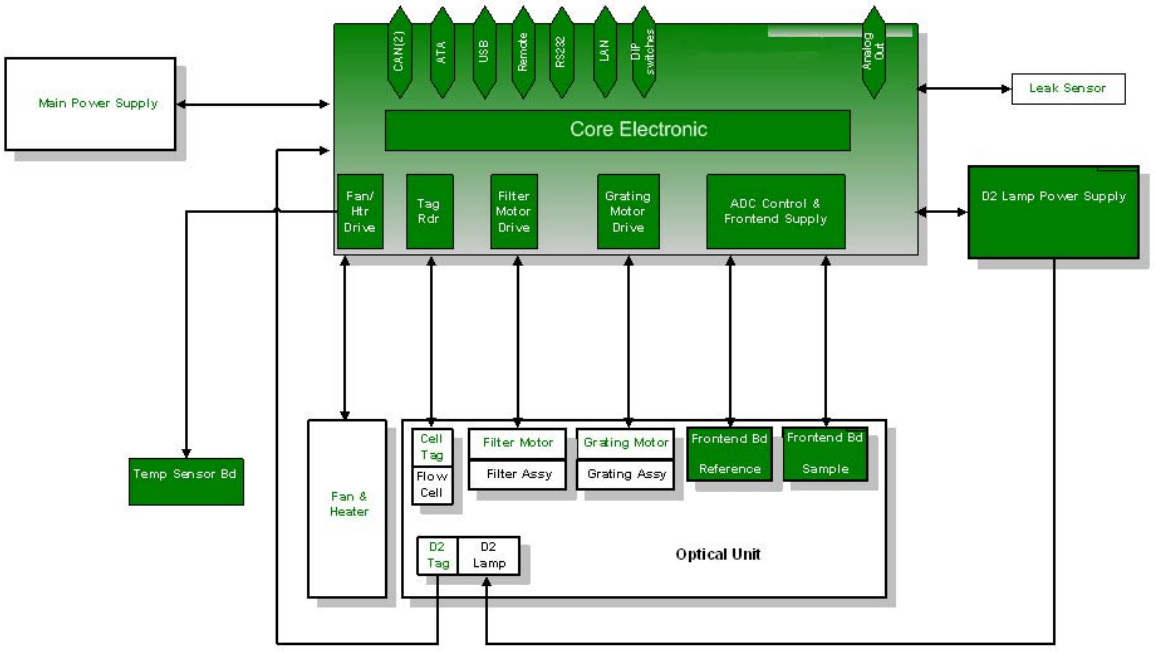


Figure 85 Functional Diagram of Main Board

Board Layout and Connectors

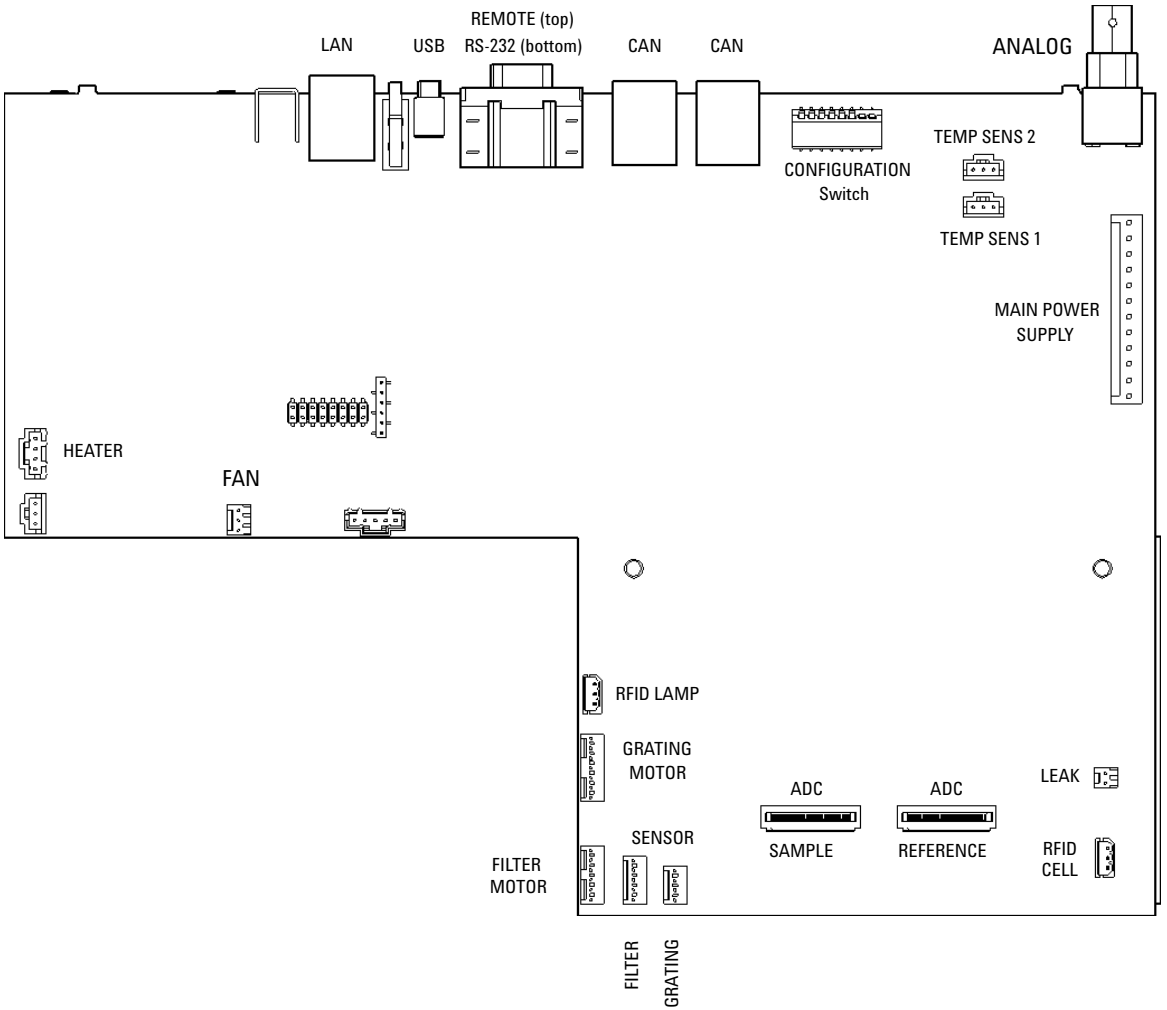


Figure 86 Board Layout and Connectors

Temperature Control

The detector is equipped with a temperature control to improve the baseline stability in unstable environments (e.g. strong variation of the temperature due to air condition systems). A heater and a temperature sensor assembly have been added and are controlled by the detector main board and its firmware. There are no parameters to be set for the temperature control.

The figures below show

- the air flow and the typical temperature gradient in the gradient (based on ambient temperature).
- the temperature uplift of 3 Kelvin and the regulation around that value.

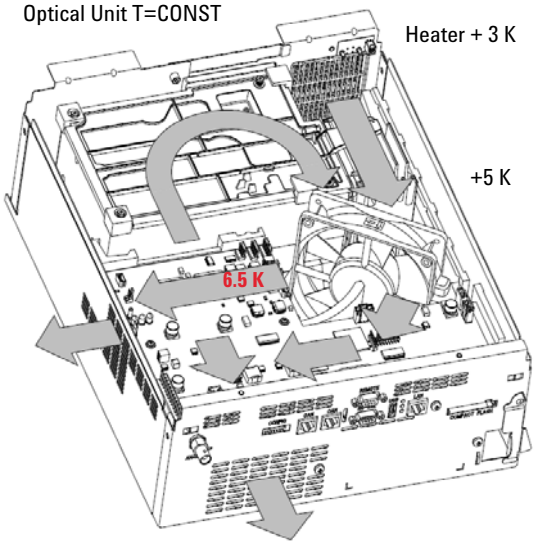


Figure 87 Temperature Control - Air Flow

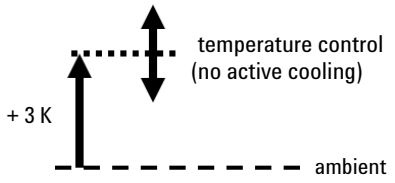


Figure 88 Temperature Control - Regulation

Lamp and Flow Cell RFID Tag

The Agilent G1314D VWD and G1314E VWD SL Plus are equipped with a lamp/flow cell-identification system. This allows to write and to read lamp/flow cell-specific information to and from the lamp/flow cell-identification tag, see “Flow Cell” on page 13 and “Lamp” on page 14.

Lamp information	Flow cell information
• product number	• product number
• serial number	• serial number
• production date	• production date
• accumulated UV on time	• nominal path length of the cell
• actual UV lamp on time	• cell volume (in nl)
• number of ignitions	• maximum pressure (in bar)
• date of last intensity test	• date of last cell test

NOTE This feature is available for special lamps and flow cells mentioned in chapter Table 26 on page 234.

USB

The USB connector is located left to the LAN connector. It is not active yet and will be used for future enhancements.

CompactFlash Card Slot

The detector has a CompactFlash card slot (G1314E VWD SL Plus only).

NOTE The G1314E VWD SL Plus is tested with the supplied CompactFlash card only. Other CompactFlash cards may vary slightly and may not work correctly.

The CompactFlash card allows constant buffering of data/spectra information so that in case of

- a busy ChemStation, that cannot take the data from the detector in time or
- a lost network connection

no application data of the detector is lost.

NOTE The G1314E VWD SL Plus must be operated with the CompactFlash card when the unique "data-never-lost" insurance is used.

Firmware Description

The firmware of the instrument consists of two independent sections:

- a non-instrument specific section, called *resident system*,
- an instrument specific section, called *main system*.

Resident System

This resident section of the firmware is identical for all Agilent 1200 series modules. Its properties are:

- the complete communication capabilities (CAN, LAN and RS-232C),
- memory management,
- ability to update the firmware of the 'main system'.

Main System

Its properties are:

- the complete communication capabilities (CAN, LAN and RS-232C),
- memory management,
- ability to update the firmware of the 'resident system'.

In addition the main system comprises the instrument functions that are divided into common functions like

- run synchronization through APG remote
- error handling,
- diagnostic functions,
- or module specific functions like
  - internal events such as lamp control, filter movements,
  - raw data collection and conversion to absorbance.

Firmware Updates

Firmware updates can be done using your user interface:

- PC and Firmware Update Tool with local files on the hard disk or.
- Instant Pilot (G4208A) with files from a USB Flash Disk or
- handheld control module (G1323A/B) with files from a PC-card.

The file naming conventions are:

PPPP_RVVV_XX.dlb, where

PPPP is the product number, for example, 1315AB for the G1315A/B DAD,

R the firmware revision, for example, A for G1315B or B for the G1315C DAD,

VVV is the revision number, for example 102 is revision 1.02

XX is the build number of the firmware

For instructions on firmware updates refer to section *Replacing Firmware* in chapter *Maintenance* or use the documentation provided with the *Firmware Update Tools*.

NOTE Update of main system can be done in the resident system only. Update of the resident system can be done in the main system only.

NOTE Some 1200 series modules are limited in downgrading due to their main board version or their initial firmware revision. For example, a G1315C DAD SL cannot be downgraded below firmware revision B.01.02 or to a A.xx.xx.

Some 1200 series SL-modules like the G1312B, G1314C, G1316B can be downgraded to lower versions by converting the module into a lower version, for example a G1312B SL pump is converted to a G1312A and looses the features of the G1312B.

All these specific informations are described in the documentation provided with the firmware update tools.

The firmware update tools, firmware and documentation are available from the Agilent web.

- http://www.chem.agilent.com/scripts/cag_firmware.asp.

Agilent 1100/1200 Series Interfaces

The Agilent 1100/1200 Series modules provide the following interfaces:

Table 42 Agilent 1100/1200 Series Interfaces

Module	CAN	LAN/BCD (optional)	LAN (on-board)	GPIB	RS-232	Analog	APG Remote	Special
Pumps								
G1310A ISO G1311A QUAT G1312A BIN G2226A NANO	2	Yes	No	Yes	Yes	1	Yes	
G1312B BIN SL	2	Yes	No	Yes	Yes	1	Yes	
G1361A PREP	2	Yes	No	No	Yes	No	Yes	CAN-DC- OUT for CAN slaves
Samplers								
G1313A STD	2	Yes	No	Yes	Yes	No	Yes	
G1329A STD G1329B STD SL G2260A PREP	2	Yes	No	Yes	Yes	No	Yes	THERMOSTAT for G1330A/B
G1364A FRC G1367A/B/C/D WPS G1377A µWPS G2258A D-LOOP	2	Yes	No	Yes	Yes	No	Yes	THERMOSTAT for G1330A/B CAN-DC- OUT for CAN slaves
Detectors								
G1314A/B VWD	2	Yes	No	Yes	Yes	1	Yes	
G1314C VWD SL	2	Yes	No	No	Yes	1	Yes	
G1314D VWD	2	No	Yes	No	Yes	1	Yes	
G1314E VWD SL+	2	No	Yes	No	Yes	1	Yes	

Table 42 Agilent 1100/1200 Series Interfaces

Module	CAN	LAN/BCD (optional)	LAN (on-board)	GPIB	RS-232	Analog	APG Remote	Special
G1315A/B DAD G1365A/B MWD	2	Yes	No	Yes	Yes	2	Yes	
G1315C DAD SL G1365C MWD SL G1315D DAD G1365D MWD	2	No	Yes	No	Yes	2	Yes	
G1321A FLD G1362A RID	2	Yes	No	Yes	Yes	1	Yes	
G4280A ELSD	No	No	NO	No	Yes	Yes	Yes	EXT Contact AUTOZERO
Others								
G1316A TCC	No	No	No	A	Yes	No	Yes	
G1316B TCC SL	No	No	No	A	Yes	No	Yes	
G1322A DEG	No	No	No	No	No	No	Yes	AUX
G1379A DEG	No	No	No	No	Yes	No	No	AUX
G4240A CHIP CUBE	2	Yes	No	No	Yes	No	Yes	CAN-DC- OUT for CAN slaves THERMOSTAT for G1330A/B (NOT USED

- CAN connectors as interface to other Agilent 1200 Series modules,
- GPIB connector as interface to the Agilent ChemStation,
- RS-232C as interface to a computer,
- REMOTE connector as interface to other Agilent products,
- analog output connector(s) for signal output, and
- interface slot for specific interfacing (external contacts, BCD, LAN and so on).

For identification and location of the connectors, see the module manual.

NOTE Never use cables other than the ones supplied by Agilent Technologies to ensure proper functionality and compliance with safety or EMC regulations.

CAN

The CAN is inter-module communication interface. It is a 2-wire serial bus system supporting high speed data communication and real-time requirement.

NOTE If a Agilent 1100/1200 series detector (DAD/MWD/FLD/VWD/RID) is in the system, the LAN should be connected to the DAD/MWD/FLD/VWD/RID (due to higher data load). If no Agilent detector is part of the system, the LAN interface should be installed in the pump or autosampler.

LAN

The 1100/1200 modules have either an interface slot for an LAN card (e.g. Agilent G1369A LAN Interface) or they have an on-board LAN interface (e.g. detectors G1315C/D DAD and G1365C/D MWD). This interface allows the control of the module/system via a connected PC with the appropriate control software (e.g. Agilent ChemStation).

GPIB

This interface is not available in all modules and may be removed from the modules in future.

The GPIB connector is used to connect the module with a computer. The address and control switches next to the GPIB connector determine the GPIB address of your module. The switches are preset to a default address and recognized by the operating software from Agilent Technologies.

RS-232C (Serial)

The RS-232C connector is used to control the module from a computer through RS-232C connection, using the appropriate software. This connector can be configured with the configuration switch module next to the GPIB connector.

The RS-232C is designed as DCE (data communication equipment) with a 9-pin male SUB-D type connector. The pins are defined as:

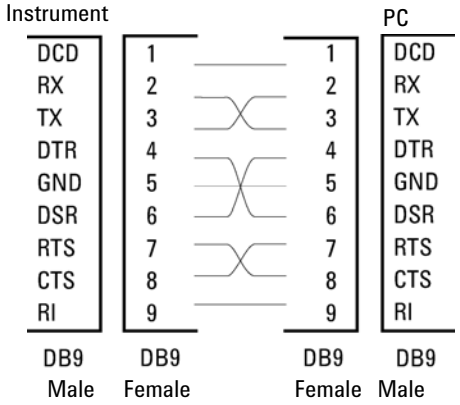


Figure 89 RS-232 Cable

Analog Signal Output

The analog signal output (e.g. detector signal or pump pressure signal) can be distributed to a recording device. For details refer to the description of the main board of the module.

APG Remote

The APG Remote connector may be used in combination with other analytical instruments from Agilent Technologies if you want to use features as common shut down, prepare, and so on.

Remote control allows easy connection between single instruments or systems to ensure coordinated analysis with simple coupling requirements.

The subminiature D connector is used. The module provides one remote connector which is inputs/outputs (wired-or technique).

To provide maximum safety within a distributed analysis system, one line is dedicated to SHUT DOWN the system's critical parts in case any module detects a serious problem. To detect whether all participating modules are switched on or properly powered, one line is defined to summarize the POWER ON state of all connected modules. Control of analysis is maintained

by signal readiness READY for next analysis, followed by START of run and optional STOP of run triggered on the respective lines. In addition PREPARE and START REQUEST may be issued. The signal level are defined as:

- standard TTL levels (0 V is logic true, + 5 V is false)
- fan-out is 10,
- input load is 2.2 kOhm against + 5 V, and
- output are open collector type, inputs/outputs (wired-or technique).

NOTE All common TTL circuits operate with a 5 volt power supply. A TTL signal is defined as "low" or L when between 0 V and 0.8 V and "high" or H when between 2.0 V and 5 V (with respect to the ground terminal).

Table 43 Remote Signal Distribution

Pin	Signal	Description
1	DGND	Digital ground
2	PREPARE	(L) Request to prepare for analysis (for example, calibration, detector lamp on). Receiver is any module performing pre-analysis activities.
3	START	(L) Request to start run / timetable. Receiver is any module performing run-time controlled activities.
4	SHUT DOWN	(L) System has serious problem (for example, leak: stops pump). Receiver is any module capable to reduce safety risk.
5		Not used
6	POWER ON	(H) All modules connected to system are switched on. Receiver is any module relying on operation of others.
7	READY	(H) System is ready for next analysis. Receiver is any sequence controller.
8	STOP	(L) Request to reach system ready state as soon as possible (for example, stop run, abort or finish and stop injection). Receiver is any module performing run-time controlled activities.
9	START REQUEST	(L) Request to start injection cycle (for example, by start key on any module). Receiver is the autosampler.

Special Interfaces

Some 1100/1200 modules have module specific interfaces/connectors. They are described in the module documentation.

Setting the 8-bit Configuration Switch

All modules with on-board LAN, e.g. G1315/65C/D, G1314D/E):

- default is ALL switches DOWN (best settings) - Bootp mode for LAN.
- for specifics LAN modes switches 3-8 must be set as required.
- for boot/test modes switches 1+2 must be UP plus required mode.

NOTE The modules have a new main board platform that differs from the other modules. Therefore the use of the 8-bit configuration switch has been changed, Refer to the module specific reference manual in case you need detailed information on an other 1200 module.

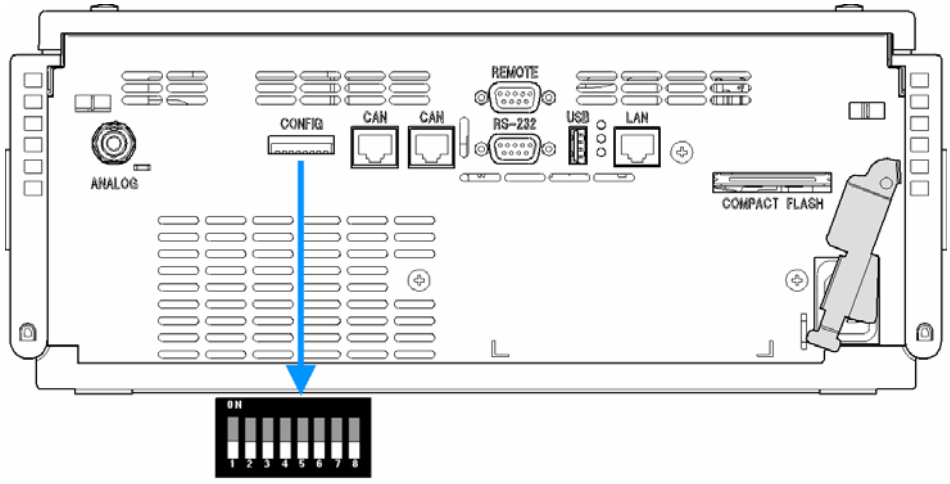


Figure 90 Location of Configuration Switch

The 8-bit configuration switch is located at the rear of the module. Switch settings provide configuration parameters for LAN, serial communication protocol and instrument specific initialization procedures.

NOTE To perform any LAN configuration, SW1 and SW2 must be set to OFF. For details on the LAN settings/configuration refer to chapter *LAN Configuration*.

Table 44 8-bit Configuration Switch

	Mode		Function					
	SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	SW 7	SW 8
LAN	0	0	Link Configuration			Init Mode Selection		
Auto-negotiation			0	x	x	x	x	x
10 MBit, half-duplex			1	0	0	x	x	x
10 MBit, full-duplex			1	0	1	x	x	x
100 MBit, half-duplex			1	1	0	x	x	x
100 MBit, full-duplex			1	1	1	x	x	x
Bootp			x	x	x	0	0	0
Bootp & Store			x	x	x	0	0	1
Using Stored			x	x	x	0	1	0
Using Default			x	x	x	0	1	1
N.A.	0	1	N.A.					
N.A.	1	0	N.A.					
TEST	1	1	System	Debug	Watchdog	N.A.		NVRAM
Boot Resident System			1	x	x			x
Stop Early To Debug			x	1	x			x
Disable Watchdog			x	x	1			x
Revert to Default Data (Coldstart)			x	x	x			1

Legend:

0 (switch down), 1 (switch up), x (any position), N.A. (not assigned)

NOTE When selecting the mode TEST, the LAN settings are: Auto-Negotiation & Using Stored.

LAN Settings

For details on the LAN settings/configuration refer to chapter *LAN Configuration*.

RS-232C Communication Settings

The communication protocol used in this instrument supports only hardware handshake (CTS/RTS). The RS-232C communication is always active (parallel to the CAN and LAN communication). For details see also *RS-232C (Serial)* in chapter "Agilent 1100/1200 Series Interfaces" on page 287.

Per default, the module will use

- 19200 baud,
- 8 data bit with no parity and
- one start bit and one stop bit are always used (not selectable).

Boot-Resident Settings

Firmware update procedures may require this mode in case of firmware loading errors (main firmware part).

If you use the following switch settings and power the instrument up again, the instrument firmware stays in the resident mode. It is not operable as a detector. It only uses basic functions of the operating system for example, for communication. In this mode the main firmware can be loaded (using update utilities).

Table 45 Stay Resident Settings

Mode Select	SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	SW 7	SW 8
TEST/BOOT	1	1	1	0	0	0	0	0

Forced Cold Start Settings

A forced cold start can be used to bring the module into a defined mode with default parameter settings.

NOTE Forced cold start erases all methods and data stored in the non-volatile memory. Exceptions are diagnose and repair log books which will not be erased.

If you use the following switch settings and power the instrument up again, a forced cold start has been completed.

Table 46 Forced Cold Start Settings

Mode Select	SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	SW 7	SW 8
TEST/BOOT	1	1	0	0	0	0	0	1

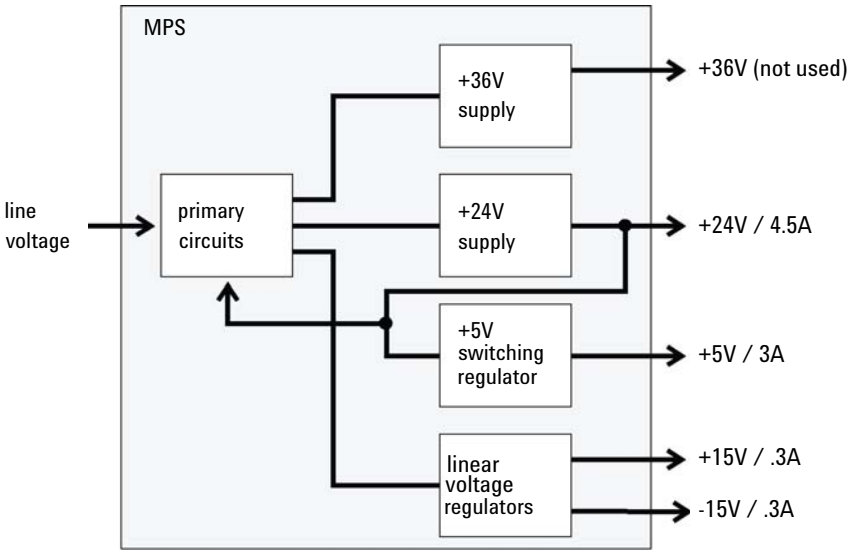
To return to normal operation, set switches back to your default configuration settings.

Main Power Supply Assembly (Standard)

The main power supply comprises a closed assembly and must not be disassembled further for safety reasons. In case of a defect, the entire power supply needs to be replaced.

The power supply provides all DC voltages used in the module. The line voltage can vary in a range from 100 – 240 volts AC ± 10 % and needs no manual setting.

The power supply provides all DC voltages used in the module except for the voltages supplied by the lamp power supply to the deuterium and tungsten lamps in the detectors. The line voltage can vary in a range from 100 – 240 volts AC ± 10 % and needs no manual setting.



NOTE To disconnect the instrument from line, unplug the power cord. The power supply still uses some power, even if the power switch on the front panel is turned off.

No accessible hardware fuse is needed because the main power supply is safe against any short circuits or overload conditions on the output lines. When overload conditions occur, the power supply turns off all output voltages. Turning the line power off and on again resets the power supply to normal operation if the cause of the overload condition has been removed.

An over-temperature sensor in the main power supply is used to turn off output voltages if the temperature exceeds the acceptable limit (for example, if the cooling fan of the instrument fails). To reset the main power supply to normal operating conditions, turn the instrument off, wait until it is approximately at ambient temperature and turn the instrument on again.

The following table gives the specifications of the main power supply.

Table 47 Power Supply Specifications (Standard)

Maximum power	160 VA / 130 W	Continuous output
Line Input	100 – 240 volts AC ± 10 %, line frequency of 50/60 Hz	Wide ranging
Pin 1	Power Fail	error message
Pin 2	AGND	
Pin 3	-15 VDC	
Pin 4	+15 VDC	
Pin 5	PGND	
Pin 6	PGND	
Pin 7	+24 VDC	
Pin 8	+24 VDC	
Pin 9	+36 VDC	not used
Pin 10	+36 VDC	not used
Pin 11	DGND	
Pin 12	+ 5 VDC	

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This chapter provides addition information on safety, legal and web.

General Safety Information

General Safety Information

The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. Agilent Technologies assumes no liability for the customer's failure to comply with these requirements.

WARNING

Ensure the proper usage of the equipment.

The protection provided by the equipment may be impaired.

➔ The operator of this instrument is advised to use the equipment in a manner as specified in this manual.

General

This is a Safety Class I instrument (provided with terminal for protective earthing) and has been manufactured and tested according to international safety standards.

Operation

Before applying power, comply with the installation section. Additionally the following must be observed.

Do not remove instrument covers when operating. Before the instrument is switched on, all protective earth terminals, extension cords, auto-transformers, and devices connected to it must be connected to a protective earth via a ground socket. Any interruption of the protective earth grounding will cause a potential shock hazard that could result in serious

personal injury. Whenever it is likely that the protection has been impaired, the instrument must be made inoperative and be secured against any intended operation.

Make sure that only fuses with the required rated current and of the specified type (normal blow, time delay, and so on) are used for replacement. The use of repaired fuses and the short-circuiting of fuse holders must be avoided.

Some adjustments described in the manual, are made with power supplied to the instrument, and protective covers removed. Energy available at many points may, if contacted, result in personal injury.

Any adjustment, maintenance, and repair of the opened instrument under voltage should be avoided whenever possible. When inevitable, this has to be carried out by a skilled person who is aware of the hazard involved. Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present. Do not replace components with power cable connected.

Do not operate the instrument in the presence of flammable gases or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.

Do not install substitute parts or make any unauthorized modification to the instrument.

Capacitors inside the instrument may still be charged, even though the instrument has been disconnected from its source of supply. Dangerous voltages, capable of causing serious personal injury, are present in this instrument. Use extreme caution when handling, testing and adjusting.

When working with solvents please observe appropriate safety procedures (e.g. goggles, safety gloves and protective clothing) as described in the material handling and safety data sheet by the solvent vendor, especially when toxic or hazardous solvents are used.

Safety Symbols

Table 48 Safety Symbols

Symbol	Description
	The apparatus is marked with this symbol when the user should refer to the instruction manual in order to protect risk of harm to the operator and to protect the apparatus against damage.
	Indicates dangerous voltages.
	Indicates a protected ground terminal.
	Indicates eye damage may result from directly viewing the light produced by the deuterium lamp used in this product.
	The apparatus is marked with this symbol when hot surfaces are available and the user should not touch it when heated up.

WARNING

A WARNING

alerts you to situations that could cause physical injury or death.

➔ Do not proceed beyond a warning until you have fully understood and met the indicated conditions.

CAUTION

A CAUTION

alerts you to situations that could cause loss of data, or damage of equipment.

➔ Do not proceed beyond a caution until you have fully understood and met the indicated conditions.

Radio Interference

Cables supplied by Agilent Technoligies are screened to provide opitimized protection against radio interference. All cables are in compliance with safety or EMC regulations.

Test and Measurement

If test and measurement equipment is operated with unscreened cables, or used for measurements on open set-ups, the user has to assure that under operating conditions the radio interference limits are still met within the premises.

Sound Emission

Manufacturer's Declaration

This statement is provided to comply with the requirements of the German Sound Emission Directive of 18 January 1991.

This product has a sound pressure emission (at the operator position) < 70 dB.

- Sound Pressure Lp < 70 dB (A)
- At Operator Position
- Normal Operation
- According to ISO 7779:1988/EN 27779/1991 (Type Test)

UV-Radiation

Emissions of ultraviolet radiation (200-315 nm) from this product is limited such that radiant exposure incident upon the unprotected skin or eye of operator or service personnel is limited to the following TLVs (Threshold Limit Values) according to the American Conference of Governmental Industrial Hygienists:

Table 49 UV-Radiation Limits

Exposure/day	Effective Irradiance
8 hours	0.1 µW/cm^2
10 minutes	5.0 µW/cm^2

Typically the radiation values are much smaller than these limits:

Table 50 UV-Radiation Typical Values

Position	Effective Irradiance
Lamp installed, 50-cm distance	average 0.016 µW/cm^2
Lamp installed, 50-cm distance	maximum 0.14 µW/cm^2

Solvent Information

Observe the following recommendations on the use of solvents.

Flow Cell

Avoid the use of alkaline solutions (pH > 9.5) which can attack quartz and thus impair the optical properties of the flow cell.

Prevent any crystallization of buffer solutions. This will lead into a blokkage/damage of the flow cell.

If the flow cell is transported while temperatures are below 5 degree C, it must be assured that the cell is filled with alcohol.

Aqueous solvents in the flow cell can built up algae. Therefore do not leave aqueous solvents sitting in the flow cell. Add small % of organic solvents (e.g. Acetonitrile or Methanol ~5%).

Solvents

Brown glass ware can avoid growth of algae.

Always filter solvents, small particles can permanently block the capillaries. Avoid the use of the following steel-corrosive solvents:

- Solutions of alkali halides and their respective acids (for example, lithium iodide, potassium chloride, and so on).
- High concentrations of inorganic acids like nitric acid, sulfuric acid especially at higher temperatures (replace, if your chromatography method allows, by phosphoric acid or phosphate buffer which are less corrosive against stainless steel).
- Halogenated solvents or mixtures which form radicals and/or acids, for example:

  $2CHCl_3 + O_2 \rightarrow 2COCl_2 + 2HCl$

  This reaction, in which stainless steel probably acts as a catalyst, occurs quickly with dried chloroform if the drying process removes the stabilizing alcohol.

- Chromatographic grade ethers, which can contain peroxides (for example, THF, dioxane, di-isopropylether) such ethers should be filtered through dry aluminium oxide which adsorbs the peroxides.
- Solutions of organic acids (acetic acid, formic acid, and so on) in organic solvents. For example, a 1-% solution of acetic acid in methanol will attack steel.
- Solutions containing strong complexing agents (for example, EDTA, ethylene diamine tetra-acetic acid).
- Mixtures of carbon tetrachloride with 2-propanol or THF.

Declaration of Conformity for HOX2 Filter

Declaration of Conformity

We herewith inform you that the

Holmium Oxide Glass Filter

used in Agilents absobance detectors listed in the table below meets the requirements of National Institute of Standards and Technology (NIST) to be applied as certified wavelength standard.

According to the publication of NIST in J. Res. Natl. Inst. Stand. Technol. 112, 303-306 (2007) the holmium oxide glass filters are inherently stable with respect to the wavelength scale and need no recertification. The expanded uncertainty of the certified wavelength values is 0.2 nm.

Agilent Technologies guarantees, as required by NIST, that the material of the filters is holmium oxide glass representing the inherently existent holmium oxide absorption bands.

Test wavelengths:

Product Number	Series	Measured Wavelength *	Wavelength Accuracy	Optical Bandwidth
79883A	1090	361.0 nm 418.9 nm 453.7 nm 536.7 nm	+/- 1 nm	2 nm
79854A	1050			
G1306A	1050			
G1315A	1100			
G1315B/C	1100 / 1200			
G1600				
79853C	1050	360.8nm 418.5nm 536.4nm	+/- 2 nm	6 nm
G1314A/B/C G1314D/E	1100 / 1200	360.8nm 418.5nm 536.4nm	+/- 1 nm	6 nm
G4286,..., 90A	1120			

*) The variation in Measured Wavelength depends on the different Optical Bandwidth.

March 04, 2008
(Date)

(R&D Manager)

(Quality Manager)

P/N 89550-90501

Revision: G
Effective by: Mar 04, 2008

Agilent Technologies

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In This Book

This manual contains ...

The manual describes the following:

- introcduction and specifications,
- installation,
- using and optimizing,
- troubleshooting and diagnose,
- maintenance and repair,
- parts identification,
- hardware information,
- safety and related information.

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